

AMOCO AUSTRALIA PETROLEUM COMPANY

REPORT

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D. DIR.	- 3 JUL 1985		E & IL
	DEPT. OF MINES		
REF. No.	6836/85		

ON

SEABED INVESTIGATION SURVEY

AROUND

LOCATION "YOLLA NO. 1"

BLOCK T-14-P

BASS STRAIT

AUSTRALIA

OR_309

Dated: 27th May, 1985

Report No. K071/85/AM

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1 INTRODUCTION

GEOMEX SURVEYS (AUSTRALIA) PTY. LTD. was contracted by AMOCO AUSTRALIA PETROLEUM COMPANY to carry out a site investigation survey around the "YOLLA No. 1" location in permit area T-14-P, in Bass Strait, Australia (see Figure 1).

The area surveyed comprised a 4 kilometre square site centred on the proposed well co-ordinates, supplied as follows:

Location: Yolla No. 1

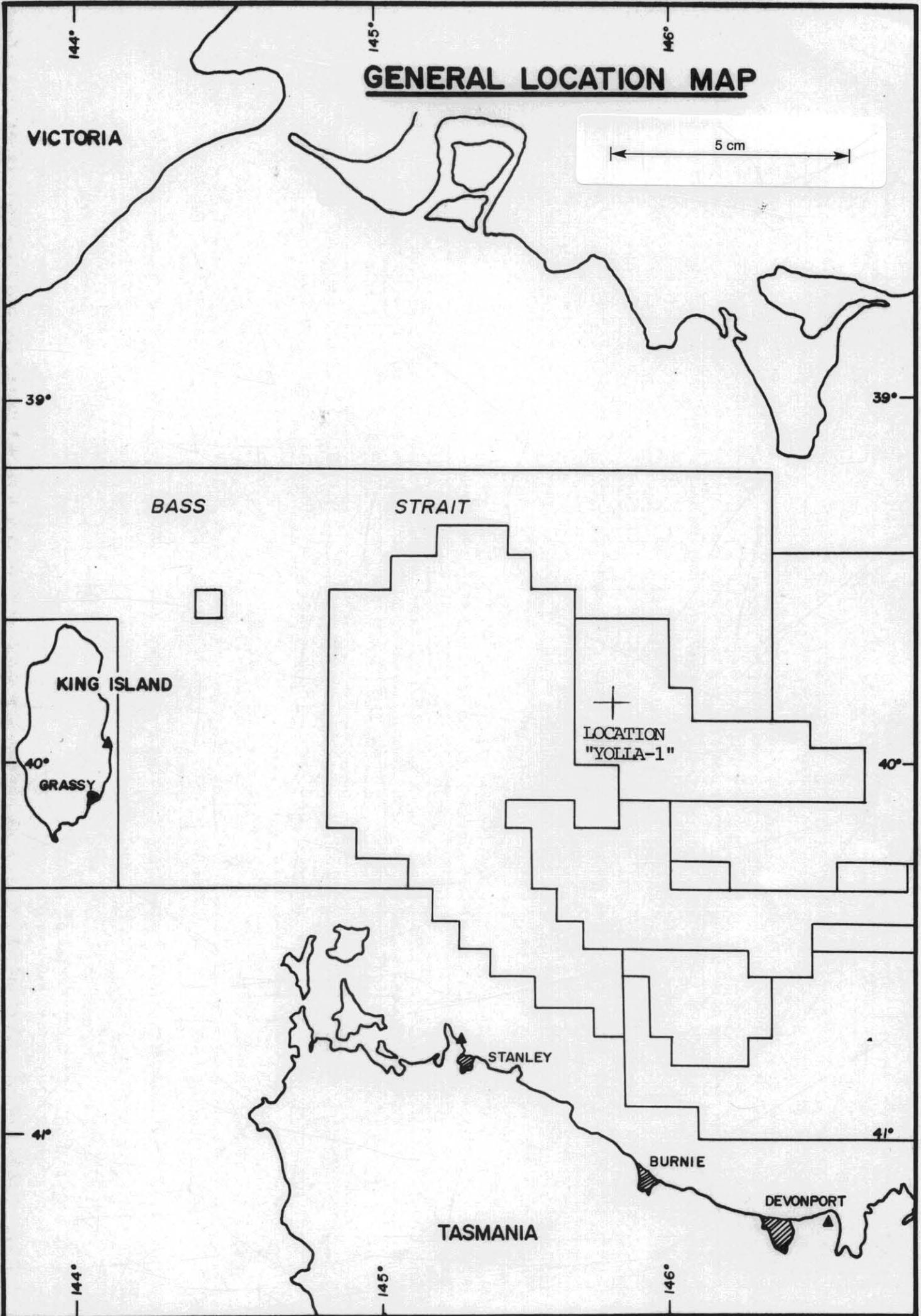
Latitude: 39° 50' 18.96" South

Longitude: 145° 48' 21.20" East

The vessel "M/V Yardie Creek" was mobilised for this survey in Devonport between 24th and 27th April 1985, and the field operations undertaken between 28th April and 3rd May 1985, using a Maxiran chain established in the area for navigation. The geophysical investigation was carried out with fathometer, side-scan sonar, shallow seismic system and grab sampler.

Seabed transponders were also laid and calibrated around the site to assist with the subsequent rig positioning.

Upon completion of the survey, the vessel returned to Devonport and was de-rigged on 3rd May 1985.



PERSONNEL, EQUIPMENT AND LOGISTICS SUPPORT2.1 Personnel

The following survey personnel were engaged on this project:

Navigation

Tony Cox : Party Chief/Hydrographic Surveyor
Graham Harries : Hydrographic Surveyor
Bruce Robinson : Maxiran Engineer
William Gray : Base Operator
Tim Moore : Base Operator

Geophysical

Jim Anderson : Geophysicist
Max Strawhorn : Acoustics Engineer
Bruce Maluish : Acoustics Engineer
Erald van den Arend: Acoustics Operator

Client's Representative

Tim Layton : ECL AUSTRALIA PTY. LTD.

2 PERSONNEL, EQUIPMENT AND LOGISTICS SUPPORT (Cont'd)2.2 Equipment

The following survey equipment was employed on this project:

2.2.1 Navigation- The Maxiran Positioning System comprising:

- One - Maxiran monitor plus one back-up
S/Ns 74, 78
- One - Maxiran interrogators plus one
back-up S/Ns 114, 151
- Three - Maxiran beacons plus two back-up
S/Ns 281, 223, 284, 286, 287
- Three - Maxiran beacons plus two back-up
S/Ns 281, 227, 232, 282, 279
- Five - Sets of yaggi antennae
- Two - Sets of omni antennae
- One - 20 kw Linear amplifier plus c/w
power supplies, plus one back-up
set S/N 1193, 1459
- Interface units, power supplies,
transformers
- Antenna cables, tower sections
- Rotor motors
- Batteries
- Maxiran spares
- Five - SSB radios

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PERSONNEL, EQUIPMENT AND LOGISTICS SUPPORT2.2 Equipment2.2.1 Navigation (Cont'd)

- The Navigation Computing System comprising:
 - One - HP 9826 computer plus one back-up
 - One - HP 2671G printer plus one back up
 - One - Scope 111 interface unit
 - Helmsmans monitor
 - Power supplies
 - Software, etc.

- The Magnavox Satellite Receiver comprising:
 - One - Mx 1107 Magnavox receiver
 - One - Marine antenna
 - Cables
 - Spares

- The Oceano Acoustic Positioning System comprising:
 - One - Range meter RM 201 S/N 009
 - One - Interface module IM 100 S/N 22
 - One - Power supply P.S. 100 S/N 27
 - One - Telecommand T.T. 201 S/N 43
 - One - Grundig velocimeter
 - One - Towcable plus AM 121 unit
 - One - Towfish
 - One - Tow cable
 - One - Transducer unit AM 121
 - Eight - Transponders RT 121
 - Oceano spares kits
 - Cables, etc.

PERSONNEL, EQUIPMENT AND LOGISTICS SUPPORT2.2 Equipment (Cont'd)2.2.2 Geophysical

- The Elac Survey Echo Sounder System
comprising:

- One - Straight line recording unit
- Echo sounder transducer
- Cables, power supplies
- Spares.

- The EG&G Side-scan Sonar System
comprising:

- One - EG&G 259-4 side-scan sonar recorder
plus one back-up
- One - EG&G 272 towfish plus one back-up
- One - Side-scan sonar cable of 500 m.
- One - Side-scan sonar winch
- Power supply, spares.

- The 1000 K-Joule Shallow Seismic System
comprising:

- One - Multi-electrode sparker plus one
back-up
- One - EG&G 232 power supply
- One - EG&G 231 trigger/capacitor bank
- One - EPC 4600 graphic recorder plus
one back-up
- One - Hydrographic streamer plus one
back-up
- One - Krohn-hite filter
- One - T.V.G. amplifier
- One - Swell filter
- Transformers and power supplies

2 PERSONNEL, EQUIPMENT AND LOGISTICS SUPPORT2.2 Equipment2.2.2 Geophysical (Cont'd)

The Additional 8 K-Joule EG&G Seismic Equipment
comprising:

- Two - EG&G 233 capacitor banks
- One - 9 element sparker-array
- Cables, etc.

2 PERSONNEL, EQUIPMENT AND LOGISTICS SUPPORT (Cont'd)

2.3 Logistics Support

The vessel "M/V Yardie Creek" operating out of Devonport in Tasmania, provided a suitable working platform with accomodation for personnel to undertake the survey.

Onshore support was provided by the Maxiran Shore-based Operators, and Maxiran Engineer in Devonport.

Co-ordination and support also being provided by the GEOMEX SURVEYS base in Perth.

3 CHRONOLOGICAL RECORD OF EVENTSWednesday 17th April 1985

- 12.00 Maxiran equipment arrived in Devonport.
19.30 Party Chief, Surveyor and Maxiran Engineer arrived in Devonport.

Thursday 18th April 1985

- 08.00 Survey party drove to Wynyard Airport to check on plane charters to King Island.
10.00 Party Chief flew to King Island.
12.00 Surveyor and Maxiran Engineer visited "The Nut" at Stanely. Contacted the Ranger and arranged hire of labour.
16.30 Party Chief returned to Wynyard after visiting the station site on King Island, arranging accomodation close to the site, the purchase of batteries and the hire of a generator on the island.
17.00 Survey party returned to Devonport to plan operations.

Friday 19th April 1985

- 07.30 Party Chief and Maxiran Engineer visited Point Sorell station and arranged occupation of the site with land-owner.
10.00 Survey party in Devonport and Launceston to arrange the purchase of camping equipment, batteries, etc.
13.00 Arranged hire of generators, and caravan for "Point Sorell" station.
18.30 Survey party returned to Devonport to plan operations.
19.00 One Base Station Operator arrived Devonport.

3 CHRONOLOGICAL RECORD OF EVENTS (Cont'd)Saturday 20th April 1985

- 08.00 Survey party hired a second vehicle to collect batteries, generators, etc. and transport Maxiran equipment to container in Devonport.
- 11.00 Survey party visited "The Bluff" trig station (to be used for short baseline calibration).
- 12.00 Surveyor, Maxiran Engineer and Base Station Operator depart for "The Nut" at Stanley, with base station equipment.
- 15.00 Base station equipment carried up "The Nut" with the assistance of labourers.
- 16.00 Party Chief in Launceston to collect additional tower sections.

Sunday 21st April 1985

- 08.00 Checked Maxiran equipment.
- 09.00 Survey party departed Devonport for Stanley to carry remainder of station equipment onto "The Nut".
- 13.00 Maxiran station installed on "The Nut".
- 14.30 Departed Stanley.
- 16.30 Returned to Devonport.

Monday 22nd April 1985

- 08.00 Party Chief, Surveyor and Maxiran Engineer to "Point Sorell" to site caravan and install base station.
- 12.00 Returned to Devonport to check on arrival of mobile units.
- 14.00 Collected generators and prepared equipment for short baseline calibration.
- 19.00 Second Base Station Operator arrived.

CHRONOLOGICAL RECORD OF EVENTS (Cont'd)Tuesday 23rd April 1985

- 09.00 Party Chief, two Acoustics Engineers and Acoustics Operator arrived Devonport.
- 11.00 Commenced short baseline calibration on Maxiran between "Point Sorell" and "Mersey Bluff", trig markers.
- 16.00 Short baseline calibration complete.

Wednesday 24th April 1985

- 08.00 Prepared Maxiran equipment for long baseline calibration between "Point Sorell" and "The Nut" trig markers.
- 10.00 Transported navigation and geophysical equipment to survey vessel "M/V Yardie Creek".
- 11.00 Commenced long baseline calibration.
- 14.00 Arranging crane lifts to load equipment onboard vessel.
- 15.00 Arranging fabrication of davit for acoustics towfish, installation of shelving in bridge, etc.

Thursday 25th April 1985 (ANZAC DAY)

- 10.00 Transported Maxiran base station equipment to King Island by charter plane, and commenced installation of equipment.
- 11.00 Mobile maxiran and navigation equipment installed onboard vessel. Geophysical equipment set-up and tested.

(Welders and crane operators unavailable on ANZAC Day).

3 CHRONOLOGICAL RECORD OF EVENTS (Cont'd)Friday 26th April 1985

- 12.00 Completed installation of navigation and geophysical equipment onboard vessel.
- 15.00 Tested seismic equipment.
- 16.00 Brackets welded and davit for acoustic system, delivered and installed.

Saturday 27th April 1985

- 10.00 Acoustic positioning equipment loaded onboard vessel.
- 11.00 Point Sorell station installed.
- 13.00 Acoustic positioning equipment installed and tested.
- 18.00 Vessel sails from Devonport.
- 22,15 Baseline crossing carried out between "Point Sorell" and "The Nut" station.

Sunday 28th April 1985

- 08.00 Completed baseline crossing carried out between "Point Sorell" and "Naracoopa" Station.
- 11.00 Survey vessel arrived at survey location "YOLLA-1".
- 11.45- Deployed six (6) acoustic transponders around
13.10 the survey area.
- 13.30 Deployed acoustic towfish.
- 13.50 Carried out temperature-salinity test.
- 14.30 Calibrated echo sounder with bar check.
- 15.00 One (1) acoustic transponder not functioning recovered and relaid replacement transponder.
- 17.30 Commenced relative calibration of acoustic transponder array.
- 22.00 Relative calibration of array completed.
- 22.30 Commence absolute calibration of array with maxiran.

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CHRONOLOGICAL RECORD OF EVENTS (Cont'd)Monday 29th April 1985

- 00.30 Completed absolute calibration of array.
02.00 Deployed geophysical equipment and ran test lines.
03.00 Commenced running survey lines.
04.30- Completed running survey lines 1, 2, 2A, 3, 4,
24.00 5, 6, 7, 8, 8A, 9, 10, 30, 31, and 32.

Tuesday 30th April 1985

- 00.00- Completed running survey lines 33, 34, 24A, 35,
24.00 36, 37, 37A, 38, 39, 40, 41, 29, 28, 27, 26, 25,
24, 24A, 23, 22, 21, 20, 19, 18 and 17.

Wednesday 1st May 1985

- 00.00- Completed running survey lines 16, 16A, 16B, 15
24.00 14, 14A, 13, 12, 11, 46, 44, 48, 50, 49, 47, 45
and 43.

Thursday 2nd May 1985

- 00.00- Completed running survey lines 48, 28A, 20, 16C,
10.00 18A, 15A and 21A.
10.30 Ran test lines using 8 KJ sparker system.
11.30- Grab sampling. Difficulty with sample recovery
13.00 due to rough sea conditions.
17.30- Completed baseline crossings, while en-route to
21.30 Devonport.

Friday 3rd May 1985

- 07.30 Vessel docked in Devonport.
15.00 Completed de-rigging survey equipment from vessel.
17.00 Geophysical equipment despatched from Devonport for return to Perth.

3 CHRONOLOGICAL RECORD OF EVENTS (Cont'd)Saturday 4th May 1985

- 10.00 Navigation and acoustic positioning equipment packed and stored in Devonport.
- 14.00 Commenced assembling maxiran equipment for re-calibration, prior to installation onboard "M/V Eugene McDermott" for "Bass Basin 1985A" seismic program.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration4.1.1 Mode of Operation

MAXIRAN POSITIONING SYSTEM - This is a medium range positioning system operating between the frequencies of 420 to 450 MHz with a bandwidth of ± 1.8 MHz. A series of phase coded pulses emitted from the mobile unit installed onboard the vessel interrogates the beacons at co-ordinated points ashore, each replying to the mobile after synchronizing code generators with a unique coded pulse. The transmission cycle is repeated once every 200 milliseconds. The mobile unit measures the time elapse allowing for propagation corrections and component delays to output the range to each beacon to a high standard of accuracy.

This system operating in its range/range mode will provide position accuracies of better than ± 10 m., in excess of 200 km. offshore.

The compact units and low power requirements of this system facilitates transportation and deployment in the field. The shore stations are each manned by one experienced operator who is responsible for the installation and 24 hour operation of his equipment. All units are in contact by SSB radio.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.2 Installation

Three (3) base stations were set-up in the North-west of Tasmania to provide radio navigation for this survey. Two were situated on the mainland ("Point Sorell" near Devonport, and "The Nut" at Stanley), and the third on King Island ("Naracoopa").

Ranges to the site from each of these stations were 155 km., 111 km. and 143 km respectively. This configuration giving good angles of cut at the survey location, the included angles for the three position lines being 63° , 46° and 109° .

Antenna positions at the three stations were the same as those used by ONA for the Client's seismic program in December 1984. Details of the offsets and co-ordinates can be found in Section 4.1.3 and in the station descriptions, Appendix 3.

Directional yaggi antennae were used onboard the "M/V Yardie Creek" and at the base stations. Omni-directional antennae mounted above the yaggis were used only briefly at the beginning of the survey, as the signal reception proved too weak for good navigation.

SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.3 Base Station Data

The three maxiran stations were installed at the following co-ordinated points:

(a) Point Sorrell

Latitude: 41° 07' 24.749" South
 Longitude: 146° 31' 41.905" East
 Eastings: 460 403.85 m.
 Northings: 5 447 405.45 m.
 Antenna Height: 42 m.

Established with a 12 m. tower, offset 1.85 metres bearing 162° from marker ST 517.

(b) The Nut

Latitude: 40° 45' 50.244" South
 Longitude: 145° 18' 13.416" East
 Eastings: 356 829.45 m.
 Northings: 5 486 045.74 m.
 Antenna Height: 155 m.

Established with a 12 m. tower, offset 1.0 metres bearing 239° from marker ST 674.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration4.1.3 Base Station Data (Cont'd)(c) Naracoopa

Latitude: 39° 55' 29.05" South
Longitude: 144° 07' 39.03" East
Eastings: 254 516.76 m.
Northings: 5 576 629.84 m.
Antenna Height: 53 m.

Erected with a 18' m. tower, offset
307.05 metres, bearing 98° 7' 14"
from marker 281/150.

All co-ordinates refer to:

Datum : Australian Geodetic
Spheroid : Australian National
Projection : UTM Zone 55
C. Meridian : 147° East

SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.4 Short Baseline Calibration

on 23rd April 1985 the Maxiran system was calibrated over a short baseline distance of 15,168 m. between "Point Sorell" station and the trig marker at "Mersey Bluff", Devonport. Land pass was negligible and conditions were clear and stable.

Both mobiles were calibrated against all five (5) beacons, using both yaggi and mobile antennae. The two transit cans were adjusted to read the same distance, after a 6 m. difference became apparent at the beginning, the alteration made by a simple potentiometer movement.

The mobiles were set up at "Point Sorell", while the beacons were installed on four 3 m. towers standing in a line perpendicular to the line to "Point Sorell" and either side of an offset marker, 10 metres on an azimuth of 74° 25' from SPM 200.

The co-ordinates for the calibration station at "Mersey Bluff" are given below:

Mersey Bluff SPM 200

Latitude:	41° 09' 37.318" South
Longitude:	146° 21' 15.143" East
Eastings:	445 819.27 m.
Northings:	5 443 223.70 m.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration4.1.4 Short Baseline Calibration (Cont'd)Mersey Bluff SPM 200 Offset

Latitude: 41° 09' 37.233" South
Longitude: 146° 21' 15.557" East
Eastings: 445 828.90 m.
Northings: 5 443 226.39 m.

The spheroid distance between "Point
Sorell" and "Mersey Bluff" (offset)
computed as:

15167.67 metres

See Appendix A for results of short base-
line calibration.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.5 Long Baseline Calibration

On 24th April 1985 a long baseline calibration was carried out between the stations at "Point Sorell" and "The Nut". The equipment configuration and the weather remaining the same as for the short baseline calibration.

The two towers with the mobile equipment at "Point Sorell" were left standing and so was at slightly different spheroidal distances from "The Nut", as shown below:

Point Sorell - Tower A offset 1.85 m.
on 162° from ST 517

Latitude: 41° 07' 24.749" South

Longitude: 146° 31' 41.905" East

Spheroidal distance from "The Nut" equals 110579 m.

Point Sorell - Tower B offset 1.9 m.
on 342° from ST 517

Latitude: 41° 07' 24.633" South

Longitude: 146° 31' 41.856" East

Spheroidal distance from "The Nut" equals 110577 m.

See Appendix A for results of long baseline calibration.

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration (Cont'd)4.1.6 Baseline Crossings

Enroute to the site on 27th April 1985, and during the return on 2nd May 1985 the baselines, Point Sorell - The Nut, and Point Sorell - Naracoopa were crossed near Wynyard.

On both occasions the signals were slightly unstable from at least one station, giving less than reliable results, as shown below:

<u>Point Sorell - The Nut</u>		(Code 1 - Code 4)	
27.04.85.	2300 hrs	120106 m.	Heading 200°
27.04.85.	2320 hrs	120107 m.	Heading 20°
Mean		<u>120106 m.</u>	
Combined Delay		<u>-9512 m.</u>	
Observed Distance		110594 m.	(x propagation factor =
Calculated Distance		<u>-110579 m.</u>	110586.9 m)
O - C		<u>15 m.</u>	

<u>Point Sorell - The Nut</u>		(Code 3 - Code 4)	
02.05.85	2100 hrs	120122 m.	Heading 200°
02.05.85	2130 hrs	120118 m.	Heading 20°
Mean		<u>120120 m.</u>	
Combined Delay		<u>-9512 m.</u>	
Observed Distance		110608 m	(x propagation factor =
Calculated Distance		<u>110579 m.</u>	110600.9 m.)
O - C		<u>29 m.</u>	

4 SURVEY METHODS AND PROCEDURES4.1 Maxiran Positioning System and Calibration4.1.6 Baseline Crossings (Cont'd)Point Sorell - Naracoopa (Code 3 - Code 6)

28.04.85.	0315 hrs	252664 m.	Heading 30°
28.04.85	0350 hrs	252663 m.	Heading 210°
28.04.85.	0420 hrs	<u>252667 m.</u>	Heading 30°
Mean		252665 m.	
Combined Delay		<u>9513 m.</u>	
Observed Distance		243152 m.	(x propagation
Calculated Distance		<u>243107 m.</u>	factor =
O - C		<u>45 m.</u>	243136)

Point Sorell - Naracoopa (Code 1 - Code 6)

02.05.85.	1915 hrs	243666 m.	Hrading 200°
02.05.8	1930 hrs	<u>243665 m.</u>	Heading 20°
Mean		243666 m.	
Combined Delay		<u>9513 m.</u>	
Observed Distance		243153 m.	(x propagation
Calculated Distance		<u>243107 m.</u>	factor =
O - C		<u>46 m.</u>	243137)

These baseline crossings were done after sunset, and is thought that there may have been a variation in the propagation between the time of calibration, and these crossings. However, when on-site with good signals, the calculated 3-way fixes produced standard deviations of less than 5 m., for the survey.

4 SURVEY METHODS AND PROCEDURES (Cont'd)4.2 Satellite-Acoustic Positioning System4.2.1 Mode of Operation

This comprises a marine satellite receiver and acoustic positioning which are integrated to provide high accuracy navigation and tracking for a vessel, or a number of vessels, any distance from the shore.

The MARINE SATELLITE RECEIVER is a MAGNAVOX MX 1107 complete with antenna and cable, which operates by monitoring the change in frequency, or doppler effect, of the 400 MHz and 150 MHz frequencies transmitted by each of the five transit satellites circling the earth in polar orbits.

Orbital data and time are received from each satellite with an up-dated message every two minutes, Interpolation of the satellite's position monitored with the change of received frequencies will provide a line of position on which the receiver lies. The recording of data from a number of satellites will therefore provide the position of the receiver. The greater the number of good satellite passes recorded, the greater the accuracy of the results.

This receiver will take account of the course and speed of a moving vessel while recording satellite passes, and interfaced to the acoustic system will provide a means of co-ordinating seabed transponders on the earth's surfaces to an accuracy of better than 10 metres.

4 SURVEY METHODS AND PROCEDURES4.2 Satellite-Acoustic Positioning System4.2.1 Mode of Operation (Cont'd)

THE ACOUSTIC POSITIONING SYSTEM used was an OCEANO system comprising four (4) on-board units; a range meter, a telecommand, an interface unit and dedicated power supply. These interrogate a number of seabed transponders, laid on the seabed, via a transducer mounted over-the-side of a vessel in a streamline towfish. The travel time to each transponder is recorded, processed onboard and passed to a HP 9826/36 computer with graphic and numeric display monitors for surface, and if required, sub-surface positioning, navigation, tracking and data logging.

The accuracy and operation of the acoustic positioning system is largely dependent on the calibration of the seabed transponder network on which all ranges and subsequent position fixing is dependent.

The calibration of the system is usually carried out at the time of deployment and involves the survey vessel steaming through the array, collecting data from both the acoustic system and the satellite navigation receiver or Maxiran, to derive the transponder co-ordinates from a series of least squares fit computations.

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4 SURVEY METHODS AND PROCEDURES4.2 Satellite-Acoustic Positioning System4.2.1 Mode of Operation (Cont'd)

The relative accuracy of this system is 1.5-3.0 metres; in operating this system these high accuracies are attained by making allowance for a number of variable factors including the seawater temperature profile, salinity, tidal heights, etc.

This system has interrogation frequencies of 8 KHz to 16 KHz on 0.5 KHz stepping with a reception bandwidth of 300 Hz and a pulse-width which can be adjusted from 6-15 milliseconds. The 16 receiver frequencies have similar frequency settings and bandwidth to the interrogation pulse.

Working ranges for the acoustic system are 5 km. to 8 km. dependent on the water depth. Up to 16 seabed transponders may be interrogated simultaneously.

All position data is displayed graphically and constantly updated on the computing system's VDU monitors or plotters.

4 SURVEY METHODS AND PROCEDURES4.2 Satellite-Acoustic Positioning System (Cont'd)4.2.2 Installation and Calibration

Upon arrival of the survey vessel on-site at 11.30 hours on 28th April 1985, an array of six (6) Oceano transponders were laid. This network comprised two (2) lines each of three transponders running from North-east - South-west across the site on either side of the location. The closest transponders remaining 1000 metres from the location and well outside the proposed rig anchor pattern.

A relative calibration of the array was carried out between 18.00 hours and 22.00 hours, on the same day. This comprised the recording of temperature and salinity measurements, the recording of baseline distances by observing minimum ranges when steaming between transponders, and the recording of ranges at a number of points throughout the transponder network to check its rigidity and the assumed V.P. factor for the signal in water, by the solution of a number of least squares computations.

After completing the relative calibration, an absolute calibration was carried out on the transponder network by stationing the vessel at its centre and recording a total of 46 corresponding acoustic and maxiran fixes simultaneously, which are used in a least squares program to find the rotational and transitional values for the network, and solve for the transponder co-ordinates.

4 SURVEY METHODS AND PROCEDURES4.2 Satellite-Acoustic Positioning System4.2.2 Installation and Calibration (Cont'd)

See Appendix B for calibration results of the seabed transponder array.

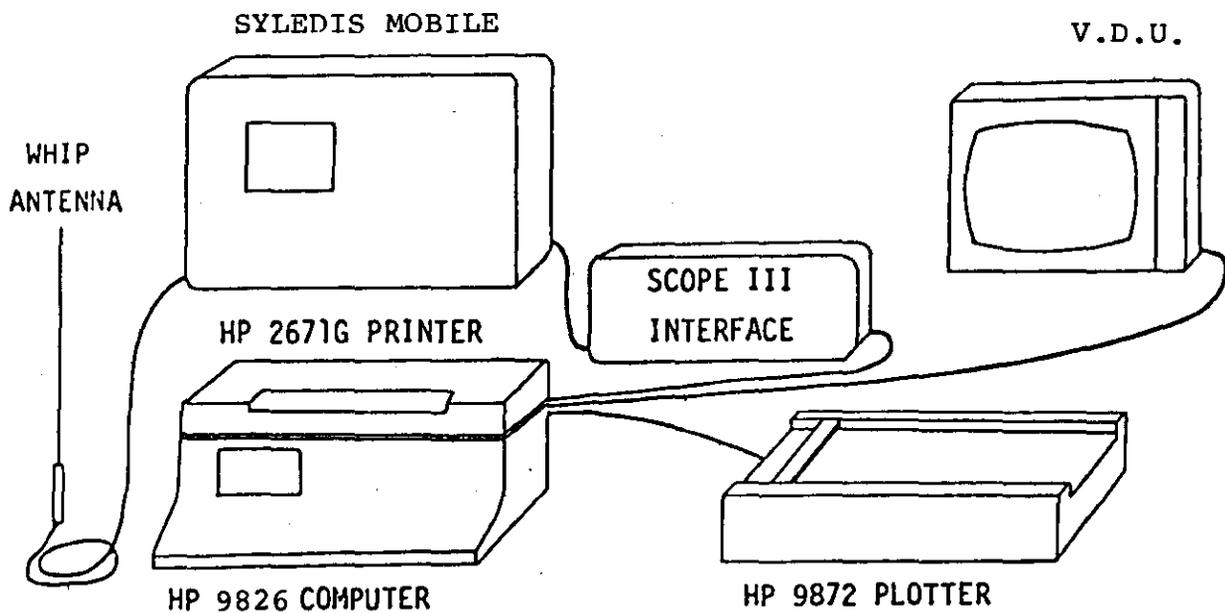
The final adjusted co-ordinates for the transponders are tabled as follows:

TRANSPONDER			POSITION	
No	Serial No.	Code	Eastings	Northings
1	552	14	399533.27	5589458.12
2	530	1	398425.68	5588623.00
3	551	9	397168.17	5587826.76
4	587	4	395892.45	5588963.09
5	650	15	397266.46	5590277.22
6	540	12	398461.37	5591128.21

The transponder network was laid on-site for the rig positioning, and to assist throughout the drilling program with relocation should weather conditions cause interruptions to the rig's operations. Repeatability of position with this network is expected to be approximately one (1) metre.

4 SURVEY METHODS AND PROCEDURES (Cont'd)4.3 Navigation Computer System

The navigation system used to track the vessel's position throughout the survey comprised a HP 9826 computer, Scope 111 interfacing unit, HP 2671G line printer and VDU displays. The system linked to the Maxiran mobile was connected for normal operation as illustrated below:



The Scope 26 consists of an interfacing unit and software which is loaded into the HP 9826 from a floppy disc. This converts the raw ranges to each of the shore stations displayed on the front of the mobile by a B.C.D. output to a co-ordinated position (corrected for system delays) on which the survey vessel's positioning is conducted. The computer displays these co-ordinates together with any offset position, off-track and along-track distances, distances/bearings to targets, vessels speed, quality of positioning, etc.

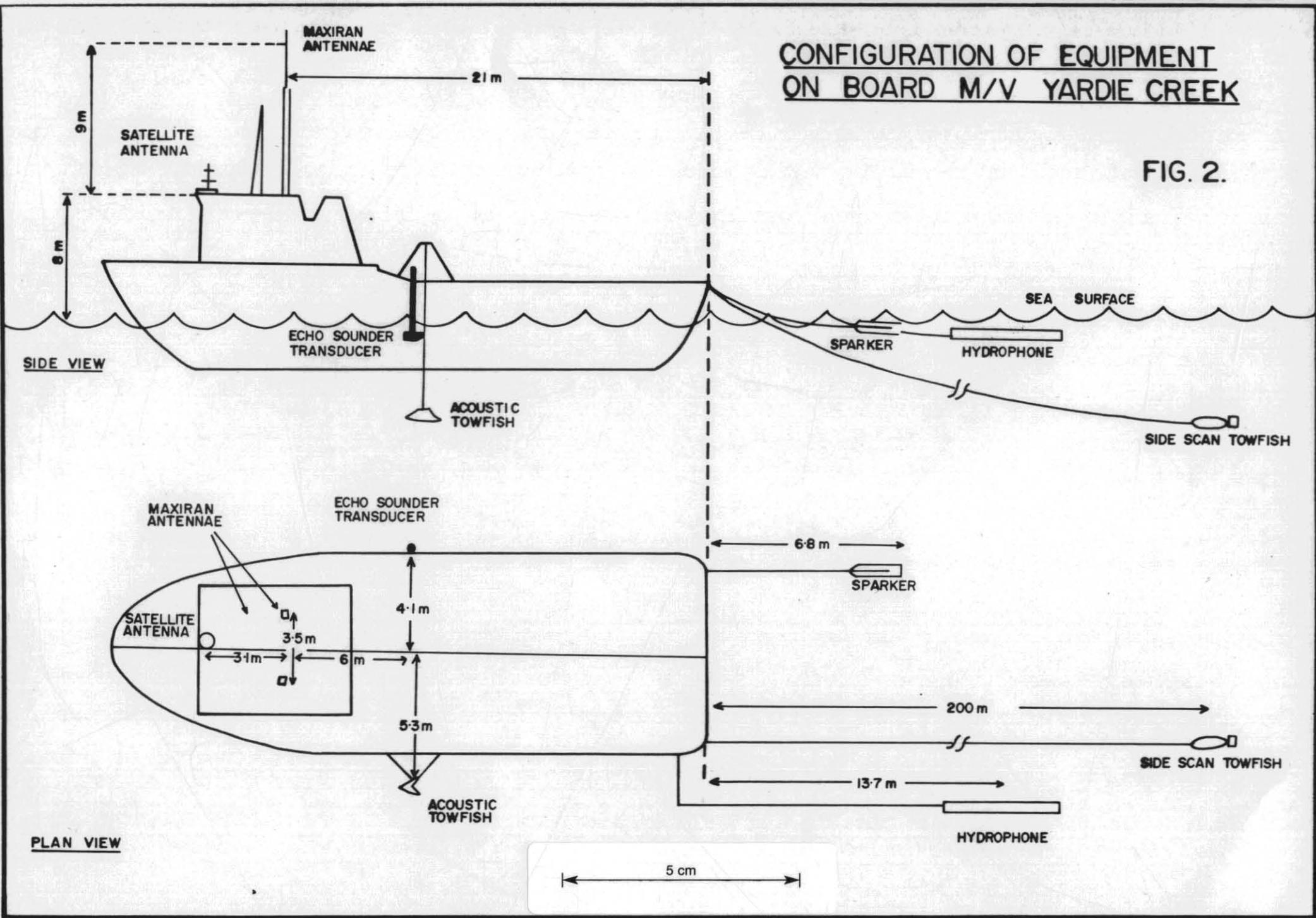
4 SURVEY METHODS AND PROCEDURES4.3 Navigation Computer System (Cont'd)

Other facilities available to the user are the ability of fix and record raw data, convert readily between different spheroids and projections, draw charts on-line and compare position with a secondary navigation system. The HP 2671G line printer provides a hard copy of all data in real time. The VDU provides a constant visual aid for navigation and gives a graphical view of the ship's position in relation to the proposed survey line.

Three-way position fixes were taken every 100 m. along pre-coordinated lines and navigation data recorded on floppy disc and the line printer. Fixes were recorded for the Maxiran antenna and offset for each piece of geographical equipment, as given in Figure 2, "Configuration of Equipment". The "Survey Line Layout" is given in Figure 3.

CONFIGURATION OF EQUIPMENT ON BOARD M/V YARDIE CREEK

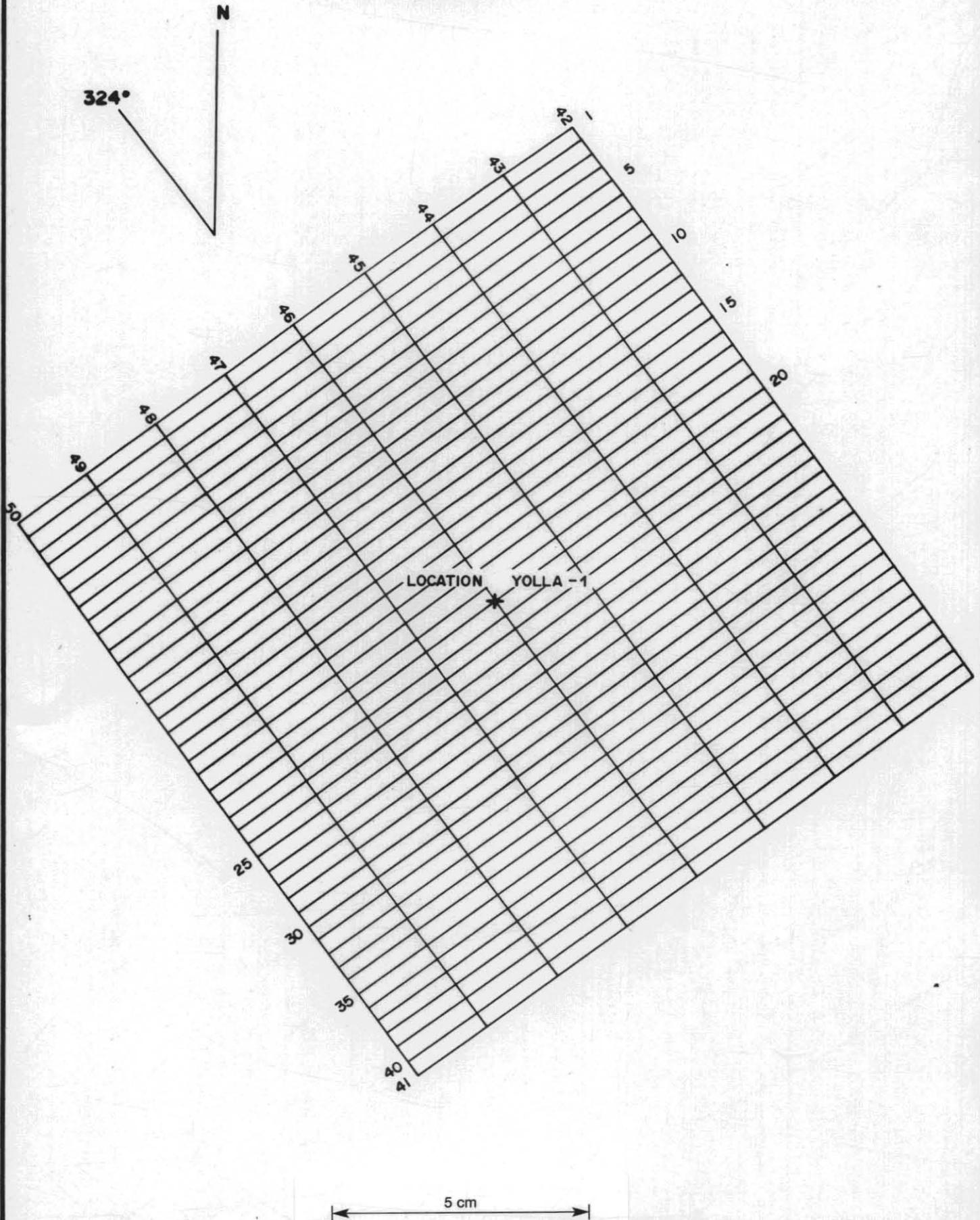
FIG. 2.



302036

SURVEY LINE LAYOUT
FOR LOCATION : YOLLA - 1
SCALE 1: 30000

FIG. 3.



4.4 Echo Sounding

Continuous bathymetric profiles were obtained using an ELAC LAZ-72 echo sounder with its transducer mounted on the starboard side of the survey vessel (see Figure 2).

The sounder was calibrated by the disk check method, to compensate for transducer draft (1.3 m.) and the prevailing speed of acoustic transmission in the water column (1484 m/sec).

The data was reduced first by drawing a mean line through the wave motion (up to 1.5 m.) superimposed on the bottom trace, then by marking a datum on the recorder and reading off the seabed levels at appropriate intervals.

To determine the appropriate tidal correction, predicted tide curves were drawn for Devonport and Stanley (on Tasmania's north coast), Grassy (on King Island's east coast), and Waratah Bay (on the south coast of Victoria). Average ranges for the period of the survey (which fell midway between springs and neaps), were Devonport 2.56 m., Stanley 2.51 m., Grassy 0.66 m. and Waratah Bay 1.84 m. As the survey area fell approximately in the middle of Bass Strait, the tide curve for Grassy was used to draw the datum on the records. However when the soundings were plotted along the survey lines, mis-ties of up to 1.1 m. were found at line intersections, presumably due to the actual tide variation being different to the predicted values for Grassy. The soundings were therefore processed further using a technique developed by GEOMEX, known as "Crossing Analysis". (1)

(1) Crossing Analysis, an Easy Method to Calculate the Tidal Curve from Bathymetric Data

4 SURVEY METHODS AND PROCEDURES4.4 Echo Sounding (Cont'd)

This method involves the adding or subtracting of small values from the soundings on each line. After the application of the technique, the mis-ties were a maximum of 0.2 m. The actual tide curve derived from the crossing analysis has been presented as Figure 4, together with the Grassy tide curve. The average range of the actual tide will be seen to be about 1.86 m. (similar, in fact, to Waratah Bay).

The bathymetric record for the line running NE - SW through the location has been reproduced as Figure 5. The sounding plan is presented as Map 2, and the results are discussed in Section 5.2.

Figure 4 is included with the maps at the back of this report.

302040

AMOCO AUSTRALIA PETROLEUM COMPANY
LOCATION "YOLLA-1"
LINE 21
ECHO SOUNDER RECORD
FIGURE 5

5 cm

DRILLING
LOCATION

100 m.

NORTH-EAST

SOUTH-WEST

10 m.

1364

1366

1368

1370

1372

1374

1376

4 SURVEY METHODS AND PROCEDURES (Cont'd)4.5 Side-Scan Sonar and Bottom Sampling4.5.1 Side-Scan Sonar

An EG&G side-scan sonar was used to map changes in seabed lithology and search for any anomalous objects on the seafloor. The fish was towed off the port side of the vessel, on 200 m. of cable, which placed the fish about 20 m. above the seabed. The recorder was set to a sweep speed giving 125 m. slant range per channel.

The side-scan sonar utilises an acoustic beam which is very narrow in the horizontal plane yet sufficiently broad in the vertical plane to impinge on targets ranging from directly under the fish out to 500 m. abeam. The two channels are fired simultaneously and then each receives echoes from the seafloor sediments to port or starboard. These acoustic signals are converted to voltages and fed up the tow cable to the wet paper recorder which uses dual helix electrodes sweeping out from the centre of the recording drum. The signal voltages cause a current to flow from the helix, through the recording paper to another electrode, and marks are created on the paper in proportion to the strength of the seabed echoes. The helix on the right prints signals from the starboard side of the towfish, while the helix on the left prints those from the port side. The results from successive firings of the fish are printed close together on the recording paper, thereby building up a graphic representation of the seafloor nature as the vessel proceeds.

SURVEY METHODS AND PROCEDURES4.5 Side-Scan Sonar and Bottom Sampling4.5.1 Side-Scan Sonar (Cont'd)

The strength of the echoes (and thus the darkness of the record) will depend on the grain-size of the seabed material (coarse sediments reflect a higher proportion of the incident energy), and the attitude to the sonar beam of any object protruding above the surrounding level. Thus, targets such as wrecks or rock outcrops will typically appear as very dark markings on the paper, with an acoustic shadow (light area) behind them.

The records are reduced by first identifying zones of contrasting reflectivity (i.e. sediment type), and anomalous features such as scours, pipelines, craters, outcrop, etc., then plotting these results on-either-side of the fish track, after adjustment of the slant ranges to true horizontal ranges.

A photocopy of the sonar record running NE - SW through the location is presented as Figure 6. The results are discussed in section 5.3.

AMOCO AUSTRALIA PETROLEUM COMPANY
LOCATION "YOLLA-1"
LINE 21
SIDE SCAN SONAR RECORD
FIGURE 6

1372
302043^{.38}

1520
RTH
ST

SOUTH-WEST

SEA SURFACE ECHO

SEABED

↑
YOLLA-1
LOCATION

← 100 m. →

↑
25 m.
↓

← 5 cm →

4 SURVEY METHODS AND PROCEDURES4.5 Side-Scan Sonar and Bottom Sampling (Cont'd)4.5.2 Grab Sampling

Due to poor weather conditions at the end of the survey, only a single grab sample was obtained, using a Van Veem sampler. The sediment recovered is described in Section 5.3.2.

4 SURVEY METHODS AND PROCEDURES (Cont'd)4.6 Seismic Reflection Profiling

The technique of seismic profiling employs a source of acoustic energy with sufficient power and low-enough frequency content to penetrate the seafloor and obtain echoes from the underlying strata. The sound source, typically a boomer or sparker, sends a pulse of energy to the seabed, where part is transmitted and part reflected. The transmitted signal, as it penetrates the sub-seafloor sediments, is in turn part-reflected and part-transmitted at succeeding interfaces separating materials with different acoustic impedances. The reflected components travel as a long wave-train up through the water column and are received by a hydrophone towed at the sea-surface next to the sound source. The hydrophone passes the signal inboard to various filters and amplifiers, before presentation on a graphic recorder. A continuous time section is built-up on the recorder by firing the acoustic source several times per second and printing the returned echoes side-by-side on the paper record.

For the YOLLA-1 site survey, a multi-electrode sparker was employed as the sound source. Short, high-voltage electrical pulses are passed from the capacitor bank, down the electrical cable to the sparker, which discharges into the water, causing vapourisation in the vicinity of the spark tips. A short-duration, multi-frequency shock wave is thereby produced, which travels downwards towards the seabed.

4 SURVEY METHODS AND PROCEDURES4.6 Seismic Reflection Profiling (Cont'd)

The sparker was towed 6.8 m. astern from the starboard stern of the survey boat and the hydrophone was suspended from a boom on the port side, to ensure it was well out of the vessel's wake. Before commencement of the survey, several trial runs were made to test the effect on record quality of various filter and amplifier settings. The filter bandpass was eventually optimised at 600 - 2000 Hz. Before presentation to the recorder, the seismic signals were passed through a two stage T.V.G. (Time-Variable-Gain amplifier). This enables the gain to be kept very low until the seabed echo is received, thereby minimising the obscuring effect of the direct sparker-hydrophone arrival on the part of the record representing the water column. The seabed return is then employed to trigger a second amplifier ramp which is used to compensate for spreading loss and absorption in the sub-seabed material.

The sparker was fired twice per second at a power of 1000 joules, to complete the grid of 41 by 9 lines. In addition, a trial line was carried out with two additional capacitor banks, permitting a power output of 8000 J at a repetition rate of 4 seconds. A nine element sparker was used. The filters were set for a bandpass of 80 to 800 Hz, and, a 1 second record taken on the EPC recorder.

4 SURVEY METHODS AND PROCEDURES4.6 Seismic Reflection Profiling (Cont'd)

Copies of both the 1000 J and 8000 J records running NE - SW through the location have been presented as Figures 7 and 8 respectively. The seismic results are shown on Map 3 and discussed in Section 5.4.

AMOCO AUSTRALIA PETROLEUM COMPANY
LOCATION "YOLLA-1"
1000J SPARKER RECORD
LINE 21

DRILLING
LOCATION

5 cm

FIGURE 7

NORTH
EAST

SOUTH-
WEST

SEABED

UNCEMENTED
SAND

REFLECTOR 1

REFLECTOR 2

10 m. = 9 m. in sand

REFLECTOR 3

REFLECTOR 4

100 m.

REFLECTOR 5

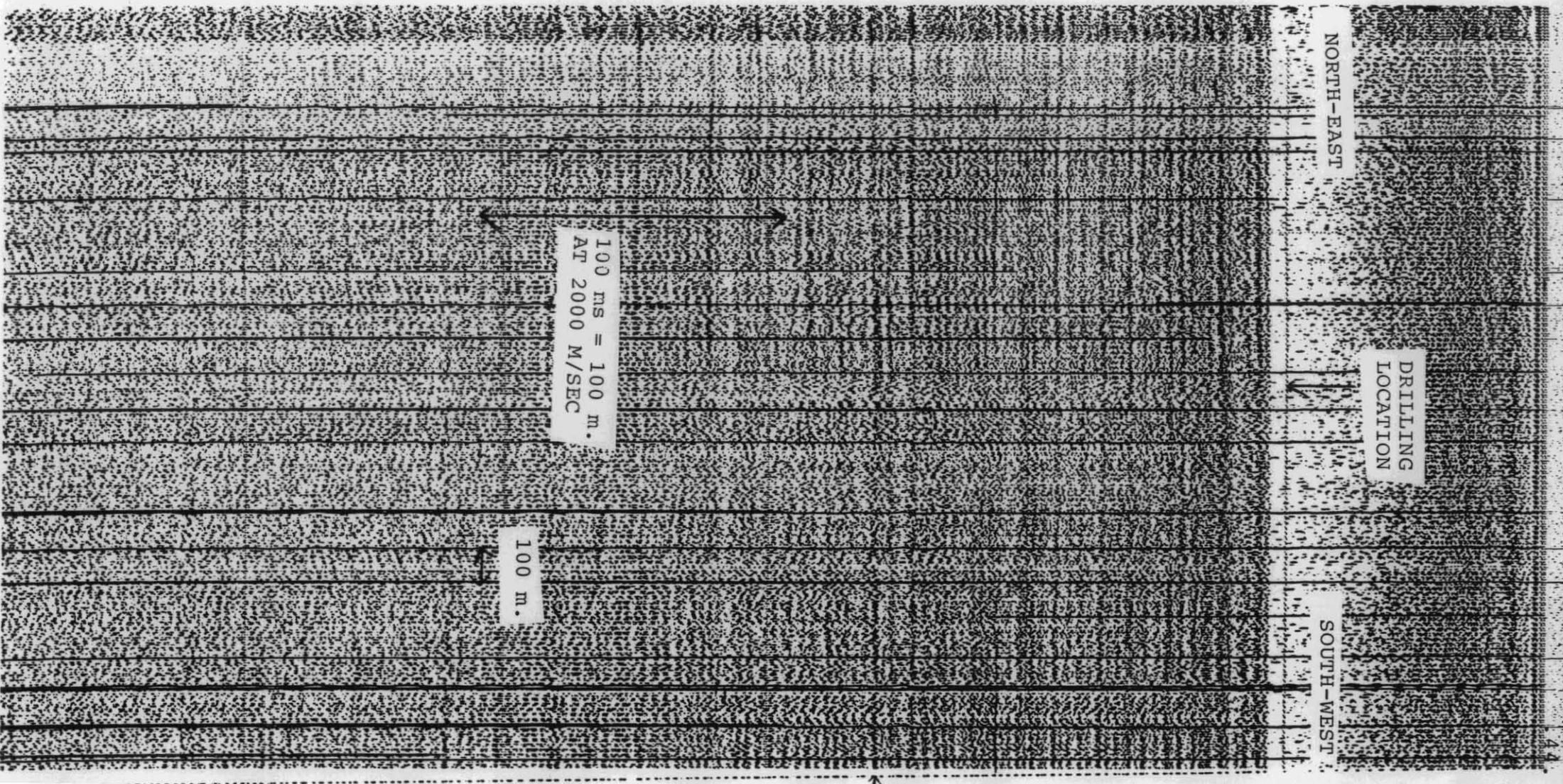
302048

43

5 cm

AMOCO AUSTRALIA PETROLEUM COMPANY
LOCATION "YOLLA-1"
LINE 21A
8000 J SPARKER RECORD
FIGURE 8

302049



RESULTS5.1 Positioning

MAXIRAN was used for navigation throughout the survey and the vessel's antenna position recorded at 100 m. intervals along each of the survey lines, as presented as Map 1.

The acoustic positioning system was only used for laying and calibrating the seabed transponder array, in preparation for the subsequent rig positioning over this location.

The line lay-out for the survey is given in Figure 3.

This survey was conducted over a four (4) kilometre square area centred on the proposed drilling location for "YOLLA-1", by running survey lines in a grid over the area using a shallow seismic system, side-scan sonar and fathometer to record the features of the seabed and sub-bottom geology. This comprised 41 lines run in a North-east - South-west direction (234°) with a 100 m. line spacing, and 9 lines run in a South-east - North-west (324°) direction with a 500 m. line spacing. A seabed sediment sample was also collected on the site close to the location.

The co-ordinates for "YOLLA-1" location were supplied as:

Latitude: 39° 50' 18.96" South

Longitude: 145° 48' 21.20" East

5 RESULTS5.1 Positioning (Cont'd)

The weather conditions during the survey were good for the first two days, but deteriorated slowly and became rough on the fifth day. The maximum signals were correspondingly affected and it was on this last day of the survey when the deteriorating weather conditions and very heavy cloud cover over one station became prevalent, that it was necessary to run the survey on only two stations. Throughout the rest of the survey period signal strengths from the navigation system were in general good, providing standard deviations from 3-way fixes of 4-5 m. during the day and about 12 m. at night.

5 RESULTS (Cont'd)5.2 Echo Sounding

The bathymetric map (map 2) shows the seafloor to be almost perfectly horizontal over the entire 4 km. x 4 km. survey area. The levels, reduced to chart datum at Grassy, King Island (which is about 0.7 m. below mean sea level in the area), range from -78.4 to -79.1 m. Seabed gradients are insignificant - less than 1 in 2000. At the proposed drilling location, the seafloor is 78.6 m. below chart datum, Grassy (79.3 m. below M.S.L.).

5 RESULTS (Cont'd)5.3 Side-Scan Sonar and Bottom Sampling5.3.1 Side-Scan Sonar

The sonar revealed a featureless seafloor, with an acoustic reflectivity consistent with fine to medium grade sandy sediment. No sand waves or other sedimentary features indicative of bottom current action were observed on the records. Similarly no bottom obstructions or hazards were revealed.

5 RESULTS5.3 Side-Scan Sonar and Bottom Sampling (Cont'd)5.3.2 Grab Sampling

Several attempts were made, in deteriorating weather conditions, to obtain a grab sample of the bottom sediment. A few millilitres of sand were eventually recovered from position: 397252 m. E, 5589134 m. N (about 650 m. SW of the drilling location), and from position: 396300 m. E, 5588558 m. N (about 1750 m. SW of location). The difficulty of recovery is probably partly due to the bad weather causing the samples to fall at an angle onto the seabed, but it is believed to also reflect the hard-packed nature of the bottom sediment. The material recovered was as follows:

Dark brown fine SAND, containing a small proportion of shells up to 3 mm. in diameter.

5 RESULTS5.4 Seismic

The 1000 J sparker recorded a series of flat-lying reflectors down to about 105 ms two-way travel time beneath the seabed. Below this level the arrival of the first seabed multiple echo makes identification of deeper horizons difficult. At an assumed average propagation velocity of 1800 m/sec, this effective penetration depth is equivalent to 94.5 m.

This efficient propagation of the seismic signals into the seabed and to considerable depths indicates an absence of cemented material at the seafloor. No shallow geological information is available within the surveyed area, hence a precise lithology cannot be assigned to each reflecting layer. The seismic boundaries represent interfaces across which there is a change in acoustic impedance (the product of the compressional shock-wave velocity and the density of the transmitting medium). Thus, sudden changes in cementation or consolidation, or grain-size changes (e.g. silt to sand or sand to gravel) may penetrate reflection. The acoustic boundaries recorded in the "YOLLA-1" area are all laterally-persistent, and of roughly similar amplitude. Therefore major changes in cementation or grainsize are considered unlikely and it is believed the sequence represents an interbedded series of silts and sands, with different degrees of consolidation.

Due to the almost horizontal nature of the strata, it was not feasible to present any particular layer as a contour plan. Five NE-SW and three NW-SE representative sections have therefore been drawn-up to show the interrelationship of the various horizons (Map 3).

5 RESULTS5.4 Seismic (Cont'd)

Seven (7) main reflectors have been plotted; they are labelled number 1 to 7. Some can be clearly seen across the entire area, while others are shown only where they are relatively strong. The following generalisations can be made:

Reflector 1 (R1) is a weak reflector, especially in the top part (NW) of the survey area. It marks, however, the first significant change from the seabed, as only a few isolated, very weak boundaries can be seen above it (these occur at depths from 3 to 6 m. and have been shown on the plan as dashed lines). R1 occurs at an average depth of about 18 m. below the seabed - little vertical change in sediment properties can be therefore be expected in this column.

Reflector 2 (R2) is a moderately-strong horizon which is evident over the whole of the area.

Reflector 3 is relatively weak and is absent along the bottom (SE) and part of the top (W) corner of the site.

Reflector 4 is the strongest and most persistent reflector identified - it can be easily traced throughout the area.

Reflector 5 is a moderately-strong, but patchy horizon, being absent in two bands running SW-NE across the site.

Reflector 6 is a moderate to strong reflector, clearly identified over all the area apart from a small zone along the NE side.

5 RESULTS5.4 Seismic (Cont'd)

Reflector 7 can be seen on some lines only due to interference with the first seabed multiple echo. It is apparently a moderate reflector.

The high power sparker trials were carried out in adverse weather conditions (20-25 knot winds), at the end of the main survey. Record quality is consequently poor. Evidence of coherent reflectors can be seen to two way travel times of 250 ms, equivalent to a depth of 250 m. beneath the seabed, assuming an average propagation velocity of 2000 m/sec. Reflector identification is extremely difficult due to multiple echoes from the many horizontal layers, however boundaries appear to be present at depths of 140, 178, 197 and 242 m. below the seabed (assuming 2000 m/sec).

302058

6 CONCLUSIONS

During the period April 29th to May 2nd 1985, echo sounding, side-scan sonar and shallow penetration analogue seismic surveys were carried out over a 4 km. by 4 km. area centred on the proposed "YOLLA-1" drilling location.

The bathymetric work showed the seafloor to be almost perfectly horizontal, with a variation of only 78.4 to 79.1 m. below chart datum at Grassy, King Island. No significant seabed gradients were recorded. At the location the level is 78.6 m. below chart datum.

The sonar records were of low to moderate reflectivity indicating a seafloor of fine to medium sand. No sedimentary features or obstructions could be identified. A grab sample of the seabed sediment comprised dark brown fine sand with a few small shells. The difficulty of obtaining a sample suggested that the sand is hard-packed.

The sparker survey recorded a series of nearly-horizontal reflectors to depths of over 90 m. beneath the seabed. No significant horizon was evident in the top 15 to 20 m. below the seabed, suggesting that the uncemented, largely unconsolidated sand prevails to at least this depth.



J.M. ANDERSON
GEOPHYSICIST

APPENDIX A

MAXIRAN CALIBRATION RESULTS

ANTENNA AND BASE STATION CONFIGURATION.TOWER FOR ANTENNA (MOBILE) ON CALIBRATION LINESTOWER 'A' (SOUTHERN)

YAGGI'S	S/N	104A / 102A
BALUN BOX	S/N	218
INTERMATOR	S/N	114
CABLE	S/N	118
OMNI ANTENNA	S/N	402

TOWER 'B' (NORTHERN)

YAGGI'S	S/N	109A / 109B
BALUN BOX	S/N	216
INTERMATOR	S/N	151
CABLE	S/N	105
OMNI ANTENNA	S/N	411

BASE STATION CONFIGURATION

BEACON	CONTROL BOX	CABLE
S/N 281 - No1	S/N 281	S/N 112
No2 - S/N 287	S/N 279	S/N 204
No3 - S/N 223	S/N 227	S/N 104
No4 - S/N 284	S/N 232	S/N 207
No6 - S/N 286	S/N 282	S/N 213

SHORT BASELINE CALIBRATION.

BASELINE DISTANCE S.P.M 200 (offset) - S.T 517. (offset) = 15168 M.

SEE PAGE OF COMPUTATION SECTION. FOR COMPUTATION CONCERNING ABOVE
LINE

MOBILE - S/N 74 (YAGUI ANTENNA).

BEACON	TOWER	RAW RANGES	ZERO SET
1	A	19 925	4 757
	B	19 925	4 757
2	A	19 924	4 756
	B	19 924	4 756
3	A	19 925	4 757
	B	19 925	4 757
4 *	A	19 923	4 755
	B	19 923	4 755
6	A	19 924	4 756
	B	19 924	4 756

* BEACON † LOWER GAIN THAN OTHER BEACONS
CHANNEL B TENDS TO READ 1M SHORT

302062

MOBILE S/N 74 (OMNI ANTENNA)

BEACON	OMNI ANT / TOWER	RAW RANGE	ZERO SET
1	S/N 402 - A	19 921	4753
	S/N 411 - B	19 916	4748
2	S/N 402 - A	19 920	4752
	S/N 411 - B	19 916	4748
3	S/N 402 - A	19 920	4752
	S/N 411 - B	19 916	4748
4	S/N 402 - A	19 918	4750
	S/N 411 - B	19 915	4747
6	S/N 402 - A	19 920	4752
	S/N 411 - B	19 916	4748

MOBILE S/N 78 (YAGI ANTENNA)

BEACON	TOWER	RAW RANGES	ZERO SET
1	A	19 923	4755
	B	19 923 ³	4755 ⁵
2	A	19 923	4755
	B	19 923	4755
3	A	19 924	4756
	B	19 924	4756
4	A	19 922	4754
	B	19 922	4754
6	A	19 923	4755
	B	19 923	4755

MOBILE S/N 78 (OMNI ANTENNA)

N.B. ON CHANNEL 'B' WHEN ZERO SET IS SET ON $\Delta\Delta\Delta 8$ or $\Delta\Delta\Delta 9$ THE RANGES DISPLAYED ON THE CHANNEL DIGITAL DISPLAY ARE IN ERROR BY AT LEAST 6M TO GREAT.

BEACON	OMNI ANT / TOWER	RAW RANGE	ZERO SET
1 *	S/N 402 - A	19921	4753
	S/N 411 - B	19916	4748
2	S/N 402 - A	19920	4752
	S/N 411 - B	19916	4748
3	S/N 402 - A	19921	4753
	S/N 411 - B	19916	4748
4	S/N 402 - A	19917	4749
	S/N 411 - B	19915	4747
6	S/N 402 - A	19919	4751
	S/N 411 - B	19915	4747

* BEACON 1. - NOT TO BE INTERROGATED ON MORE THAN ONE CHANNEL

LONG BASELINE CALIBRATION

302064

BASELINE DISTANCE $SP674$ (offset) - ST517 (TOWER A) = 110579
 $ST674$ (offset) - ST517 (TOWER B) = 110577

MOBILE S/N 74 (YAGGI ANTENNAS)

BEACON	TOWER	RAW RANGE	RANGE AFTER ZERO SET APL	Δ {MEAS DIST - Sph DIST}	PROPAGATION FACTOR
1	A	115 347	110 588	9	0.999 918 617
	B	115 344	110 586	9	0.999 918 615
2	A	115 343	110 586	7	0.999 936 701
	B	115 340	110 583	6	0.999 945 742
3	A	115 348	110 590	1311	0.999 900 534
	B	115 342	110 583	6	0.999 945 742
4	A	115 342	110 585	6	0.999 945 743
	B	115 338	110 581	4	0.999 963 827
6	A	115 342	110 587	8	0.999 927 659
	B	115 338	110 582	5	0.999 954 785
MEAN				7.3 M	0.999 935 797 (0.999 935 796)

MOBILE S/N 74 (OMNI. ANT)

BEACON	TOWER	RAW RANGE	RANGE AFTER ZERO SET APL	Δ (MEAS DIST - Sph DIST)	PROPAGATION FACTOR
1	A	115 336	110 581	2	0.999 981 914
	B	115 332	110 583	6	0.999 945 742
2	A	115 335	110 582	3	0.999 972 871
	B	115 328	110 579	2	0.999 981 913
3	A	115 334	110 581	2	0.999 981 914
	B	115 330	110 581	4	0.999 963 827
4	A	115 331	110 580	1	0.999 990 957
	B	115 328	110 579	2	0.999 981 913
6	A	115 334	110 580	1	0.999 990 457
	B	115 328	110 577	0	1.0

MOBILE S/N 78 (YAGUI ANTENNA)

302065

BEACON	TOWER	RAW RANGE	RANGE AFTER ZERO SET APL	Δ (MEAS DIST - SPH DIST) m	PROPAGATION FACTOR
1	A	115344	110589	10	0.999909575
	B	115341	110588	11	0.999900532
2	A	115339	110586	7	0.999936701
	B	115336	110583	6	0.999945742
3	A	115343	110588	9	0.999918617
	B	115340	110583	6	0.999945742
4	A	115349	110584	5	0.999954786
	B	115337	110580	3	0.999972870
6	A	115342	110588	9	0.999918617
	B	115338	110583	6	0.999945742
MEAN				7.2	0.999934892 (0.999934892)

MOBILE S/N 78 (OMNI ANTENNAS)

BEACON	TOWER	RAW RANGE	RANGE AFTER ZERO SET APL	Δ (MEAS DIST - SPH DIST) m	PROPAGATION FACTOR
1	A	115336	110583	4	0.999963828
	B	115332	110584	7	0.999936700
2	A	115335	110582	3	0.999972871
	B	115331	110581	4	0.999963827
3	A	115333	110580	1	0.999990957
	B	115330	110582	5	0.999954785
4	A	115330	110581	2	0.999981914
	B	115327	110579	2	0.999981913
6	A	115332	110581	2	0.999981914
	B	115328	110580	3	0.999981913
MEAN				3.3	(0.999970158) (0.999970158)

∴ PROPOGATION FACTORS

MOBILE	S/N 74	YAGGI.	0.999 935 797
		OMNI.	0.999 979 201

MOBILE	S/N 78	YAGGI	0.999 934 892
		OMNI	0.999 970 158

302007

APPENDIX B

ACOUSTIC TRANSPONDER ARRAY

CALIBRATION RESULTS

RESULTS OF RELATIVE CALIBRATION

	Xp. 1	Xp. 2	Xp. 3	Xp. 4	Xp. 5	Xp. 6	St	RMS
St. 1	3.4E-2	3.1E-1	4.1E-1	1.4E-1	2.4E-1	6.4E-2		2.4E-1
St. 2	3.0E-1	1.2E-1	1.9E-3	4.3E-2	4.1E-1	5.2E-1		3.0E-1
St. 3	2.2E-1	4.0E-1	1.3E-1	8.0E-2	4.7E-1	3.6E-1		3.1E-1
St. 4	2.0E-1	7.1E-2	3.2E-1	2.0E-1	5.3E-1	5.9E-1		3.7E-1
St. 5	4.1E-1	2.4E-1	8.3E-2	5.3E-2	4.7E-1	5.5E-1		3.6E-1
St. 6	8.2E-2	5.9E-2	2.0E-1	4.3E-1	2.6E-1	8.2E-2		2.3E-1
St. 7	4.0E-1	3.3E-1	1.6E-1	2.5E-1	2.1E-3	5.8E-1		3.4E-1
St. 8	1.6E-1	9.5E-1	*****	9.2E-1	9.0E-1	*****		8.0E-1
St. 9	8.3E-3	4.9E-1	6.2E-1	2.7E-1	8.4E-2	5.8E-2		3.4E-1
St.10	2.1E-1	1.4E-1	9.4E-2	1.4E-2	1.7E-1	1.6E-1		1.5E-1
St.11	1.8E-1	3.1E-1	3.2E-1	1.2E-1	1.6E-1	7.4E-2		2.1E-1
St.12	1.7E-1	1.4E-1	1.9E-1	7.8E-2	4.4E-1	1.8E-1		2.3E-1
St.13	5.3E-1	8.5E-1	2.1E-1	3.0E-1	4.9E-1	1.3E-1		4.8E-1
St.14	6.2E-3	1.9E-2	3.4E-2	5.2E-2	8.1E-2	3.9E-2		4.5E-2
St.15	2.4E-1	1.3E-1	1.1E-1	1.9E-1	5.7E-2	1.1E-1		1.5E-1
Xp RMS	2.6E-1	4.1E-1	2.6E-1	3.0E-1	3.9E-1	3.3E-1		

----- : distance not known

***** : distance rejected

List of the selected ranges

3600	2450	1559	168	1923	3369
2570	1903	2061	1438	484	1925
2603	1910	2032	1388	532	1975
2142	2457	3369	3054	1154	362
2155	2414	3293	2959	1058	451
384	1370	2812	3445	2067	1624
380	1300	2744	3394	2046	1656
1928	546	976	2258	2172	3056
1973	591	921	2237	2188	2948
3415	2033	552	1575	2747	3960
3483	2103	620	1575	2792	4017
3793	2584	1530	386	2212	3650
3868	2648	1549	467	2305	3743
1786	1082	1738	1924	948	1812
1835	1065	1663	1862	981	1889

relative position of the transponders

Xp01 :	0.00	0.00	70.00
Xp02 :	1401.11	0.00	70.00
Xp03 :	2894.02	-134.16	70.00
Xp04 :	3206.42	-1843.49	70.00
Xp05 :	1291.02	-2042.74	70.00
Xp06 :	-190.70	-1994.84	70.00

Square residum 5.94E+04 Valid dist 90 Variance : 2.57E+01

Results of the absolute calibration

302069

Rejected stations : ,11,15,21

fix	radio position	corrected acous. posit.	distance
1	396378.00 5588278.00	396366.05 5588261.40	20.46
2	396376.00 5588273.00	396363.02 5588257.42	20.28
3	396375.00 5588269.00	396359.97 5588250.44	23.88
4	396373.00 5588266.00	396357.95 5588247.45	23.89
5	396340.00 5588232.00	396353.92 5588243.48	18.04
6	396369.00 5588260.00	396352.91 5588242.49	23.78
7	396365.00 5588255.00	396351.89 5588238.50	21.08
8	396361.00 5588251.00	396346.84 5588232.53	23.27
9	396357.00 5588246.00	396341.81 5588227.57	23.89
10	396353.00 5588243.00	396339.79 5588225.58	21.86
11	*****,** *****,**	*****,** *****,**	*****,**
12	396346.00 5588236.00	396329.79 5588224.65	19.79
13	396344.00 5588233.00	396328.73 5588216.66	22.37
14	396341.00 5588228.00	396326.70 5588212.67	20.96
15	*****,** *****,**	*****,** *****,**	*****,**
16	399235.00 5590751.00	399245.94 5590756.90	12.43
17	399233.00 5590746.00	399241.89 5590750.93	10.17
18	399232.00 5590742.00	399243.86 5590745.92	12.49
19	399232.00 5590737.00	399244.82 5590740.91	13.40
20	399230.00 5590733.00	399241.79 5590736.93	12.43
21	*****,** *****,**	*****,** *****,**	*****,**
22	399226.00 5590723.00	399238.74 5590729.95	14.52
23	399225.00 5590720.00	399236.71 5590724.97	12.72
24	399223.00 5590716.00	399232.66 5590718.00	9.86
25	399222.00 5590713.00	399231.65 5590717.00	10.45
26	399219.00 5590708.00	399227.64 5590715.03	11.14
27	399218.00 5590705.00	399230.59 5590709.01	13.22
28	399215.00 5590701.00	399220.58 5590707.08	8.25
29	399212.00 5590696.00	399217.58 5590707.10	12.43
30	399209.00 5590692.00	399217.54 5590701.10	12.48
31	397712.00 5589525.00	397713.17 5589533.81	8.89
32	397708.00 5589522.00	397710.14 5589529.83	8.12
33	397705.00 5589519.00	397707.12 5589526.85	8.13
34	397702.00 5589517.00	397703.09 5589522.88	5.98
35	397699.00 5589513.00	397700.07 5589519.90	6.99
36	397695.00 5589511.00	397699.05 5589516.91	7.16
37	397694.00 5589507.00	397694.03 5589514.95	7.95
38	397691.00 5589503.00	397696.95 5589503.93	6.02
39	397689.00 5589500.00	397689.98 5589507.98	8.04
40	397687.00 5589496.00	397689.93 5589500.98	5.78
41	397685.00 5589492.00	397686.90 5589496.00	4.42
42	397683.00 5589488.00	397681.91 5589498.03	10.09
43	397680.00 5589485.00	397680.87 5589492.04	7.09
44	397679.00 5589481.00	397676.87 5589492.07	11.27
45	397677.00 5589477.00	397675.80 5589483.08	6.19
46	397676.00 5589473.00	397673.79 5589481.09	8.39

channel	position on file	new position
14	399529.60 5589462.30	399533.27 5589458.12
1	398428.00 5588619.30	398425.68 5588623.00
9	397176.20 5587814.10	397168.17 5587826.76
4	395892.40 5588941.30	395892.45 5588963.09
15	397257.00 5590265.20	397266.46 5590277.22
12	398445.80 5591124.70	398461.37 5591128.21

Mean Error : 14.61
 Acoustic rotation point : 397783.63 5589511.77
 Translation (east = +) : 4.07
 Translation (north = +) : 8.28
 Rotation : .41
 Heading of transponder 1 to transponder 2 : 232.98

APPENDIX C

MAXIRAN BASE STATION

DESCRIPTIONS

302071

STATION: POINT SORELL (ST 517)

LOCATED: This station is located on the highest point of Point Sorell, Tasmania, Australia, which is 4.8 kilometres from Hawley Beach, 1 kilometre from Port Sorell, and approximately 26 kilometres by road east of the city of Devonport. On a clear day, Badger Head, on the eastern entrance of Port Sorell, is visible from the station.

The station marker is geographically located on a point, 150 metres from the water's edge (Bass Strait). Rocks lay about the station. Some of the rocks extend up to 1 foot above ground level. Vegetation in the area is mainly green grass and patches of tussock up to 1 metre high. On the landward side, the point slopes gradually with black soil pasture riddled with Mutton bird burrows. Once on the flats, which are very wet during winter, vegetation ranges from scattered trees to patches of dense woods.

On a clear day, the city of Devonport can be seen 20 miles away, at a bearing of 260°. Beach areas, separated by rocks, are located 900 metres from the station, at a bearing of 200°. Small patches of trees are located 500 metres, at a bearing of 080° from the station. A 80-metre by 30-metre island is located offshore, approximately 800 metres, at a bearing of 060°, from the station.

ACCESS: In dry weather a regular two-wheel drive vehicle may be used but the grassy slopes on the approaches to the station site may become very slippery when wet and there are numerous boggy patches after heavy rains and a four-wheel drive vehicle is necessary.

STATION: POINT SORELL (ST 517)

ACCESS:
(Cont'd)

If four-wheel vehicles are unavailable or it turns wet after the station is set, Roger Moncreiff has a tractor which is available to tow the vehicle to and from the station site. The tractor may also be required to tow even a four-wheel drive vehicle if it is heavily laden in extreme wet conditions.

From Devonport, drive on the Bass Highway towards Launceston for 2 kilometres past the East Devonport turnoff, and turn left at the Exeter/Port Sorell turnoff (B19), near the top of the rise. Follow this road towards Port Sorell (the Exeter road turns off to the right), for approximately 12 kilometres to a road intersection, located approximately 2 kilometres before entering Port Sorell. A wooden sign showing "Hawley Caravan Park" is on the left side of this intersection. Turn left at this intersection, and follow the road to Hawley Beach. Turn left at a "T" junction, located 50 metres before the Hawley Beach Store and Post Office. Just after making this left turn, a prominent sign to the right reads "Heavy Vehicles Only" (see sketch). Follow this sealed road to its end at a "T" junction with a chlorine station facing you on the other side of the road. Turn left at this junction. A right turn takes you on a foreshore track. Follow this road (it turns to gravel half-way along) for approximately 700 metres (passing a picnic spot and toilets on the right), to a white wooden gate. Immediately in front of the gate, the road veers to the right. A turn to the left is marked "LMC Private Road". Take this turn to the left (it is 3 kilometres to the station at this point). Follow this road for approximately 100 metres and turn to the right. Straight ahead at this point is the residence of Mr. Roger Moncreiff

STATION: POINT SORELL (ST 517)

ACCESS: the son of the station site landowner. Drive
(Cont'd) for approximately 300 metres to a locked gate. At this gate, a track leads to the right to the residence of Mr. Don Moncreiff, the station site landowner, located approximately 100 metres from this gate. Obtain a key for this gate, or if opened, follow the road straight ahead to double gates, near the council sewage pond, which are usually opened. The station marker will be visible from the double gates at a distance of approximately 2 kilometres. This is no defined road from this point to the marker. Seek the landowner's advice or follow the tracks shown on the sketch.

MARKER: The station marker, located on a hill, consists of a brass mushroom S.P.M., which is not numbered. The marker is embedded in concrete at ground level, with stones surrounding the marker.

The maxiran tower was erected 1 metre, at a bearing of 270° Magnetic, from the station marker. This offset was necessary due to a 3-metre high quadropod that is erected over the marker. The quadropod is painted white, and has a black disc, approximately 60 cm in diameter, attached to the top. Rocks covers each leg of the quadropod. Co-ordinates are listed in this description for the station marker and the Maxiran tower offset.

GENERAL: Labour can be provided by Mr. Roger Moncreiff, Labour can also be obtained in Devonport, approximately 22 km. from the station, or Latrobe, approximately 19 km. away. Fuel, oil, camping equipment and supplies are available in Devonport. Bulk fuel can be obtained from several depots located in Devonport. There is a service station in Port Sorell, and a reasonable selection of goods can be obtained at the Hawley Beach

STATION: POINT SORELL (ST 517)

GENERAL: and Post Office. Drinking water can be obtained
(Cont'd) from the station property landowner or his son.

A caravan with heater is essential at this site. The winter months, June to September, can be very wet, windy and cold. Temperatures can range from several degrees below zero to a daily maximum of as low as 4° C. Extra rope and star stakes should be taken for tying down during this period. Penguins are very frequent visitors to the station site particularly at night.

Caravans are available from Devon Coastavans, 116, Nicholls Street, Devonport, telephone: Ian Finch, 004-242829. Mr. Finch will deliver and pick up the vans to the station sites for a nominal fee (In August 1984, Point Sorell was A\$20.00, Doctors Rocks was A\$40.00. This fee includes delivery and pick-up). The vans are well equipped, gas approximately 60-litre water tank (full on delivery), crockery, cutlery, fridge, etc. Mattresses are supplied, but there is no blankets, pillows or sheets. The vans can be locked. The caravans must be kept clean when vacating.

Vehicles may be obtained from HERTZ, Oldaker Street, Devonport (tel: 004-241013). HERTZ representatives have been very helpful and can assist regarding fuel supplies from Mobil Devonport if required.

Four wheel drive vehicles may also be obtained from Regent Filling Station, 57, Marine Terrace, South Burnie. This is the Shell Service Station past the paper mill on the Bass Highway, as you approach Burnie from Devonport. The contact at

STATION: POINT SORELL (ST 517)

GENERAL: this palce is Mr. Wayne Cross. The service station telephone no. is 004-312131.
(Cont'd)

A 40 foot tower was erected at this site, although only a height of 20 ft. is required to clear surrounding obstructions. Clear vista is from 200° (through north) to 060°, Star stakes were used to secure the tower.

Permission to occupy the station must be obtained from the landowner, Mr. Don C. Moncreiff, Hawley Beach via Latrobe 7307, Tasmania. His telephone number is 004-286193. Mr. Moncreiff was paid a daily rental fee of A\$25.00 for the use of his land. If Don Moncreiff is absent, permission may be obtained from his son, Roger Moncreiff, tel: 004-286587. Roger lives approximately 1 kilometre from Don Moncreiff (see Sketch).

SKETCH: See next page.

Co-ordinates of the station marker were obtained from a Lands Department, Tasmania, Division of National Mapping summary sheet.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID
ZONE 55, C.M. 147° EAST - A.G.D.

MARKER CO-ORDINATES

Lat.	41° 07' 24.69" S	N = 5 447 407 m.
Long.	146° 31' 41.88" E	E = 460 403 m.
Elev.	30 m.	

STATION: POINT SORELL (ST 517)
(Cont'd)

The Maxiran tower was erected 1.85 m. on a bearing of 162° from the marker.

MAXIRAN CO-ORDINATES

Lat.	41° 07' 24.75" S	N =	5 447 405 m.
Long.	146° 31' 41.91" E	E =	460 404 m.
Elev.	42 m.		

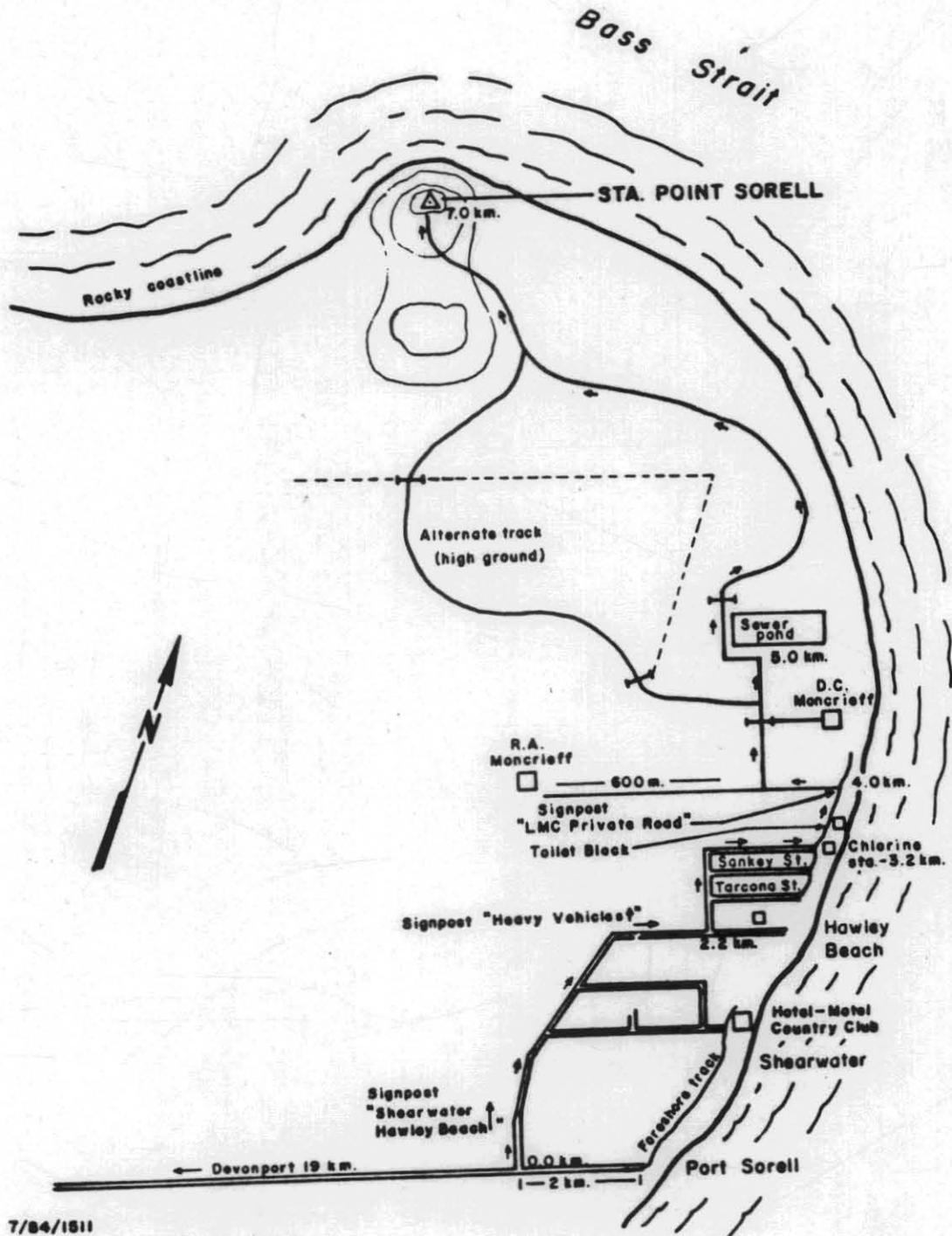
302077

STA. POINT SORELL (ST 517) — AUSTRALIA

LAT. 41°07'24".69 S
LONG. 146°31'41".88 E (MARKER COORDS.)
ELEV. 30 meters

N 5,447,407 meters
E 460,403 meters

UTM PROJ. — AUST. NAT. SPHEROID
ZONE 55, C.M.147°E — A.G.D.

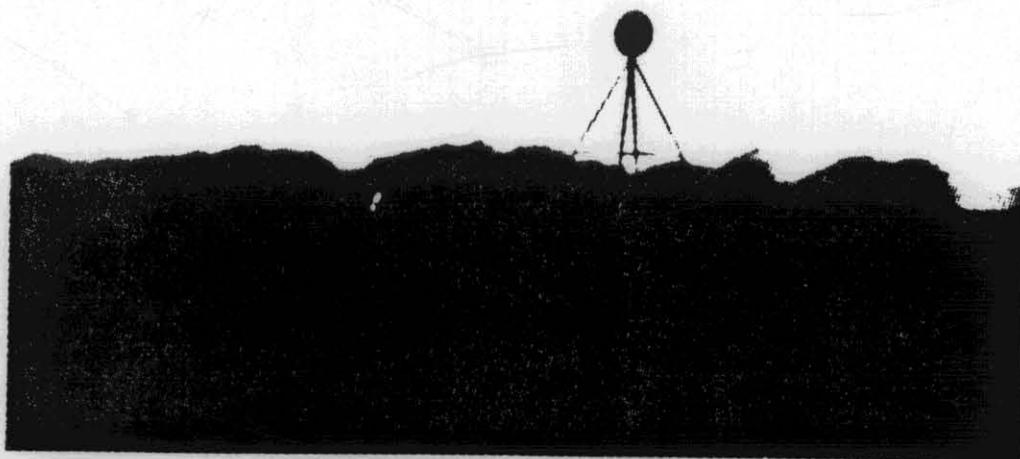


302078

STATION POINT SORELL



SIGN AT TURNOFF TO LEFT ENTERING ROAD TO DON MONCRIEFF PROPERTY. POINT IS ABOUT 3 KILOMETERS FROM STATION.



QUADROPOD OVER MARKER

302079

STATION POINT SORELL



SIGN AT TURNOFF FROM PORT SORELL ROAD. TURN LEFT TO REACH STATION, A DISTANCE OF APPROXIMATELY 7 KILOMETERS FROM THIS POINT.

STATION: THE NUT (ST 674)

LOCATED: This station is located on a hill overlooking the town of Stanley, on the north coast of Tasmania, Australia. The hill is named "The Nut" and its summit is flat to slightly rolling. This hill, as well as the historical town of Stanley, are very popular tourist attractions. The vegetation on this hill consists of grass and low native bushes. There is a tourist walk track around the perimeter of the top which is some 4 km. around. There are many mutton bird burrows along this track. The surrounding district, Circular Head, derives its name from the distinctive shaped "Nut" which juts into Bass Strait. The station marker is on the northern side of The Nut.

ACCESS: Access to the town of Stanley can be made from Burnie or Devonport. It must be noted that minor towns may not appear on road signs. When leaving Devonport, read "Smithton" for "Stanley". At times, only route numbers appear in lieu of town names. It is approximately 120 km. from Devonport to Stanley.

Drive north on the Bass Highway to the intersection with the Stanley Highway (B21). This intersection is 64 km. past Wynyard. Turn onto Stanley Highway and drive 7 km. to the town of Stanley. The Nut will be easily seen to the northeast of Stanley, right beside the town. The road to the hill is signposted "Nut". A vehicle can be taken as far as the car park on the slopes of The Nut. A zi-zag 1 m. wide cement track with centre hand rail leads from the car park to the summit. Take the left hand track at the fork on the top of the hill. The station marker is from 400-500 m. along this track. It is a walk of about 20-30 minutes (unburdened) from the base of the hill to the station.

STATION: THE NUT (ST 674) (Cont'd)

MARKER: The station marker consists of a brass mushroom S.P.M., which is not numbered. The marker is embedded in concrete which is at ground level. A 1.26 m. high stone cairn is built 2.5 m. W.N.W. of the marker.

A 3.86 m. high quadropod has been erected close to the marker. The quadropod has a 60 cm. diameter black disc attached to its top.

The Maxiran tower was erected 1.0 m. at a bearing of 239° Magnetic from the marker. Co-ordinates are listed in this description for the brass mushroom marker, and the Maxiran tower offset.

GENERAL: Food, fuel, oil and water is unavailable in Stanley. Fuel and oil can be obtained from W.T. House, Inc. BP Service Station. Mr. House can also assist in obtaining labour. Labour may also be obtained at the Union Hotel. Emergency water can be obtained from a tank near the old telecom hut, which is located alongside the lookout, approximately 700 m. from the station site.

Although limited camping equipment is available in Stanley, this should be purchased in larger centres, such as Burnie or Devonport.

Hotel accomodation are available at the Union Hotel in Stanley. The nearest airport to this station is in Smithton, approx. 20 miles away.

The station site is completely exposed to weather. This should be taken into consideration when erecting the station. Ample bedding, tent pegs, and spare rope should be taken. During the winter months (June through to September), the site is very cold and damp. A heater is

STATION: THE NUT (ST 674)

GENERAL: essential as temperatures frequently drops below
(Cont'd) zero.

A 40 ft tower was erected at this site. Star stakes were sufficient to secure the tower. Clear vista from 20 ft. up the tower is from 300° (through north) to 090°.

The station site is on land owned by the National Parks and Wildlife Service. Permission to occupy the site was obtained from Mr. P. Murrell, Director, in Sandy Bay, Tasmania 7005. His office address in Sandy Bay is Magnet Court or P.O. Box 210, Sandy Bay, Tasmania 7005. Telegrams addressed "TASPAWS", will be received by the director. No rent was paid for the use of this property. The local inspector is Mr. Rex Gatenby, Launceston tel: 003-415306.

The local ranger in charge is Mr. Brian Carson, tel: 004-581320. His resident is located near the rectory and old school in the old section of Stanley. Mr. Carson was very helpful in all matters. He can arrange for storage of empty equipment boxes at the car park house.

The site is to be kept clean and tidy during occupation. All rubbish is to be removed at the conclusion of a survey.

It will take 2-3 days with a 4 or 5 labourers to carry the equipment to the station site. An average round-trip from the car park to the station site, walking with a load and returning unburdened will take from 60 to 90 minutes, depending on the load. The cement track to the summit is very difficult to negotiate with heavy

STATION: THE NUT (ST 674)

GENERAL: objects with the center hand rail. When possible, a helicopter should be used to mobilise and demobilise this station. The Stanley Football Ground is used as a lift-off and put-down point for the helicopter. Permission can be obtained to use the ground from the Football Club president, Mr. Graham Trenelly, Union Hotel, Stanley, tel: 004-581161. It is approx. a 5 minute flight from the football ground to the station site. It is approx. 50 km. from the Wynyard Airport to The Nut.

SKETCH: See next page.

Co-ordinates of the station marker were obtained from a Lands Department, Tasmania, Division of National Mapping summary sheet.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID
ZONE 55, C.M. 147° EAST - A.G.D.

MARKER CO-ORDINATES

Lat.	40° 45' 50.23" S	N =	5 486 046 m.
Long.	145° 18' 13.45" E	E =	356 830 m.
Elev.	143 m.		

The Maxiran tower was erected 1.0 m. on a bearing of 239° Magnetic, from the station marker.

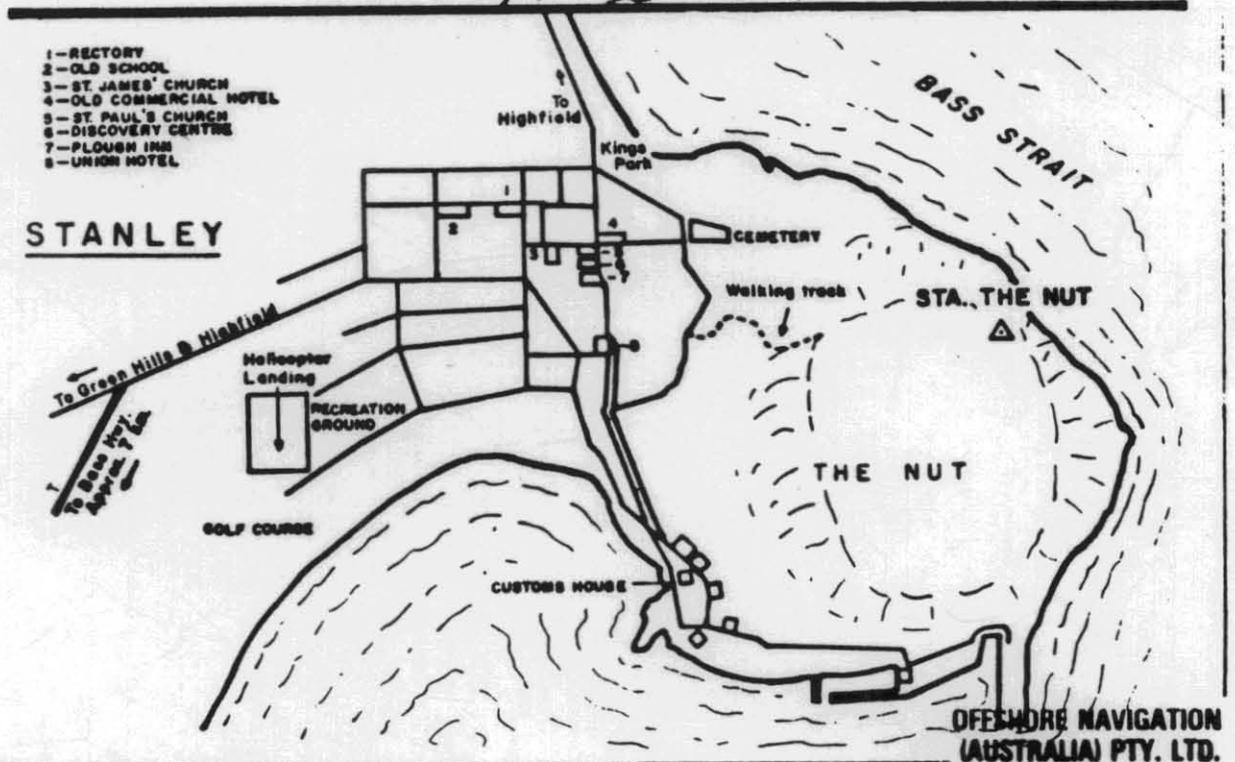
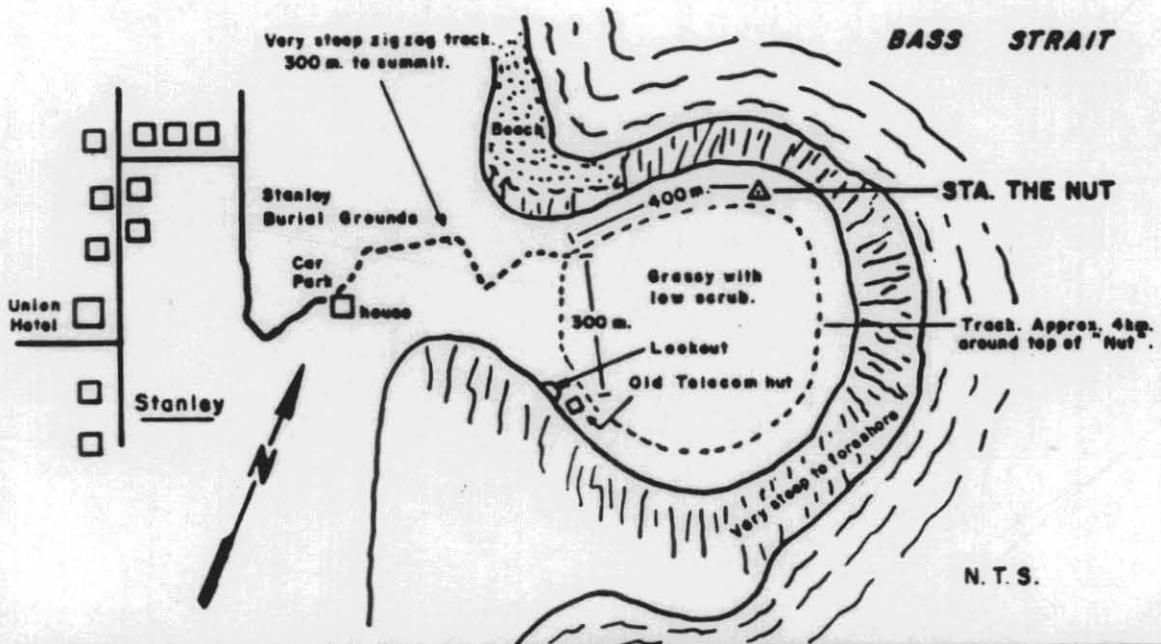
MAXIRAN CO-ORDINATES

Lat.	40° 45' 50.24" S	N =	5 486 046 m.
Long.	145° 18' 13.42" E	E =	356 829 m.
Elev.	143 m.		

STA. THE NUT (ST 674) — AUSTRALIA

LAT. 40°45'50".23 S
 LONG. 145°18'13".45 E (MARKER COORDS.) N 5,486,046 meters
 E 356,830 meters
 ELEV. 143 meters

UTM PROJ. — AUST. NAT. SPHEROID
 ZONE 55, C.M. 147° E — A.G.D.



5 cm

STATION: NARACOOPA

LOCATED: Station Naracoopa is located in a paddock in the village of Naracoopa, King Island, Tasmania, Australia. The station site overlooks the Mobil oil tanks and jetty. The paddock is of grass on top soil with an underfelt of clay. The two markers at this site are located on the north end of the paddock, on the edge of a hill.

ACCESS: Fraser Bluff is in the village of Naracoopa, approximately 20 km. from the main town of Curry on King Island. Just as you enter the village, there is an intersection with a signpost to the right towards "Millbrook". Turn onto Millbrook Road and drive 0.8 km. to a turn-off and gate to the left. Go through this gate and drive to the right around a small dam. Continue on through the scrub to the paddock. Drive through the paddock to the ridge and station site.

Heavy rain fall can be expected during June through September. In the event of a recent rainfall, a four-wheel drive vehicle or tractor will be needed to reach this site as the paddock can become very marshy. Tractors can be obtained from Mr. D. Spittle, whose telephone number is 004-611206. If the ground is marshy and no tractor or 4-wheel drive vehicle is available, it is a distance of approx. 250 yards from the staging area to the site.

MARKER: Two markers exist and consist of two brass plaques embedded in cement 3 inches below ground level. Both positions are marked by star pickets. One plaque is inscribed "ONI ARGO 1984" and the second is inscribed "GSI SYLEDIS 1984".

STATION THE NUT

FROM TURNOFF AT STANLEY BURIAL GROUND



FROM THE OUTSKIRTS OF STANLEY. NOTE ZIG-ZAG TRACK UP MOUNTAIN. THIS IS THE ONLY ACCESS ROUTE BY FOOT.

STATION: NARACOOPA (Cont'd)

GENERAL: Local labour is not available unless prior arrangements are made in the village. Ian Whitehouse, who transported the station to the site in 1984, can make arrangements for Labour from Curry.

All supplies for the site should be purchased in Curry. Websters Store has everything necessary in regard to hardware. Cars and caravans can also be obtained in Curry. A 4-wheel drive vehicle or tractor must be leased from private sources.

There is a cafe in Naracoopa that is owned by Mr. and Mrs. Hoopwood. Limited food supplies can be obtained from there.

During dry season, there is limited water on the island, and water must be purchased in Curry.

There is no electricity in the area. However, power will be available within 2 years.

Heavy winds can be expected at this site from all directions. Winds from the southwest and east are the stronger, and can reach from 40 to 80 knots. A tent at this site would most likely not survive, especially during the winter months.

In the event a tent or caravan cannot be placed at this site, the operator may be able to stay in an empty house 150 to 200 yards from the site. The house and out buildings nearby are owned by Mrs. Gail Henderson, who also owns the property on which the site is located. She lives in Curry.

STATION: NARACOOPA

GENERAL: Everyone on the island is helpful. However,
(Cont'd) prior arrangements must be made for any assistance that is required.

Permission to occupy the station site must be obtained from Mrs. Gail Henderson.

A 60 ft Maxiran tower was erected over the ARGO marker. A minimum tower height of 40 ft is required to clear surrounding obstructions. Clear Vista is from 120° to 340°. Star pickets were used to secure the towers. The anchors must be doubled and driven into the ground. Also, they must be taken out at the end of an operation as their remaining in the paddock will constitute a hazard for cattle and other livestock.

SKETCH: See next page.

Co-ordinates of this station were provided by ONA.

UTM PROJECTION, AUSTRALIAN NATIONAL SPHEROID
ZONE 55, C.M. 147° EAST - A.G.D.

MARKER CO-ORDINATES (281/150)

Lat.	39° 55' 27.64" S	N = 5 576 663 m.
Long.	144° 07' 26.23" E	E = 254 211 m.

The Maxiran tower was erected over the Argo marker, on an offset of 307.051 m., at an adjusted azimuth of 98.1204805551° from the (281/150) marker.

MAXIRAN TOWER CO-ORDINATES

Lat.	39° 55' 29.05" S	N = 5 576 630 m.
Long.	144° 07' 39.03" E	E = 254 517 m.
Elev.	53 metres.	

STA. NARACOOPA — AUSTRALIA

MARKER (281/150) COORDINATES

LAT. 39°55'27".64 S
LONG. 144°07'26".23 E
ELEV. Not reported

N 5,576,663 meters
E 254,211 meters

UTM PROJ. — AUST. NAT. SPHEROID
ZONE 55, C. M. 147° E — A. G. D.

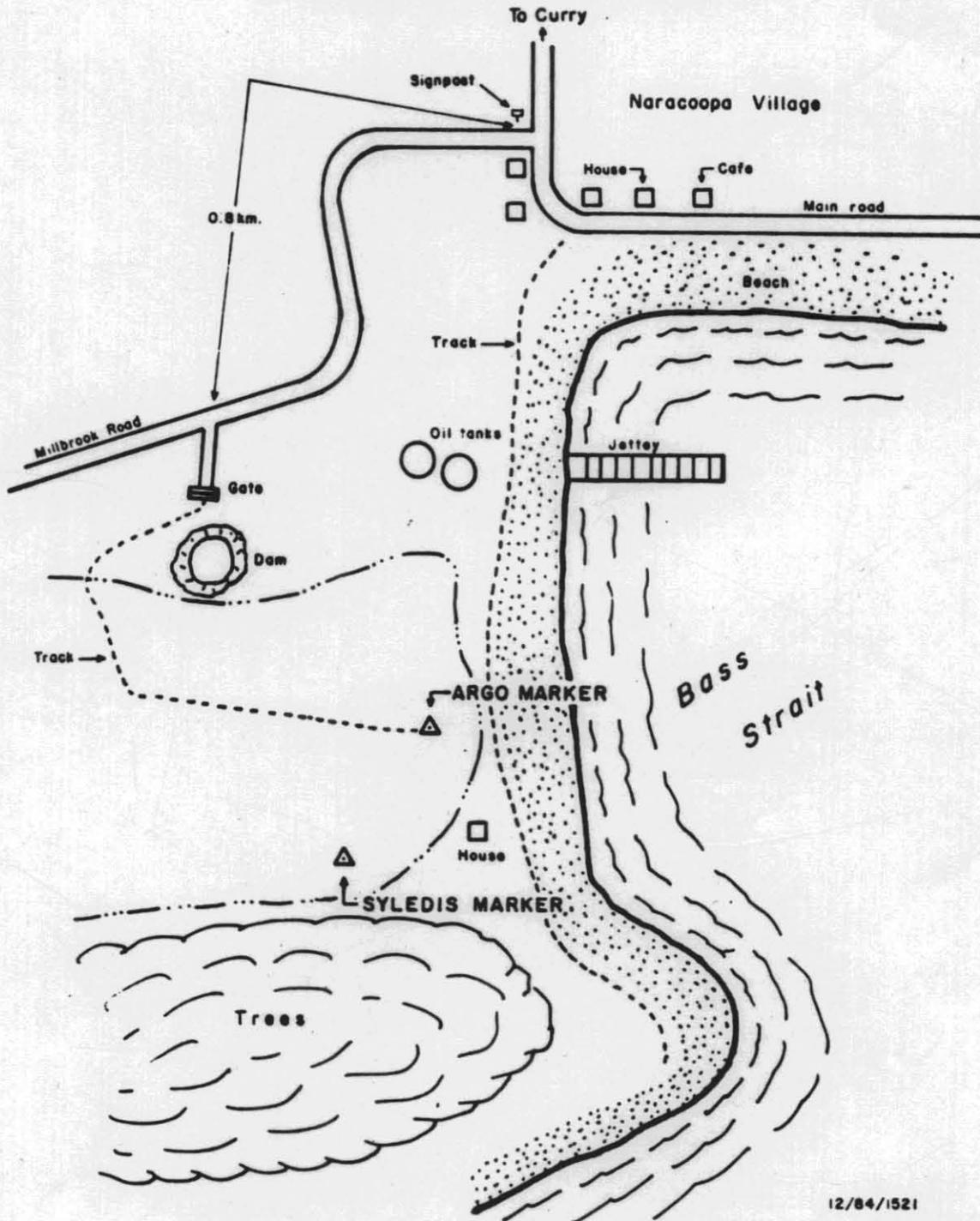


FIG. 4.

5 cm

TIDAL CURVES FOR YOLLA 1 LOCATION

TIDAL HEIGHTS ABOVE CHART DATUM AT GRASSY, KING ISLAND

3.0m
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2

0200 0600 1000 1400 1800 2200 0200 0600 1000 1400 1800 2200 0200 0600 1000 1400 1800 2200 0200 0600 1000

29/4/85

30/4/85

1/5/85

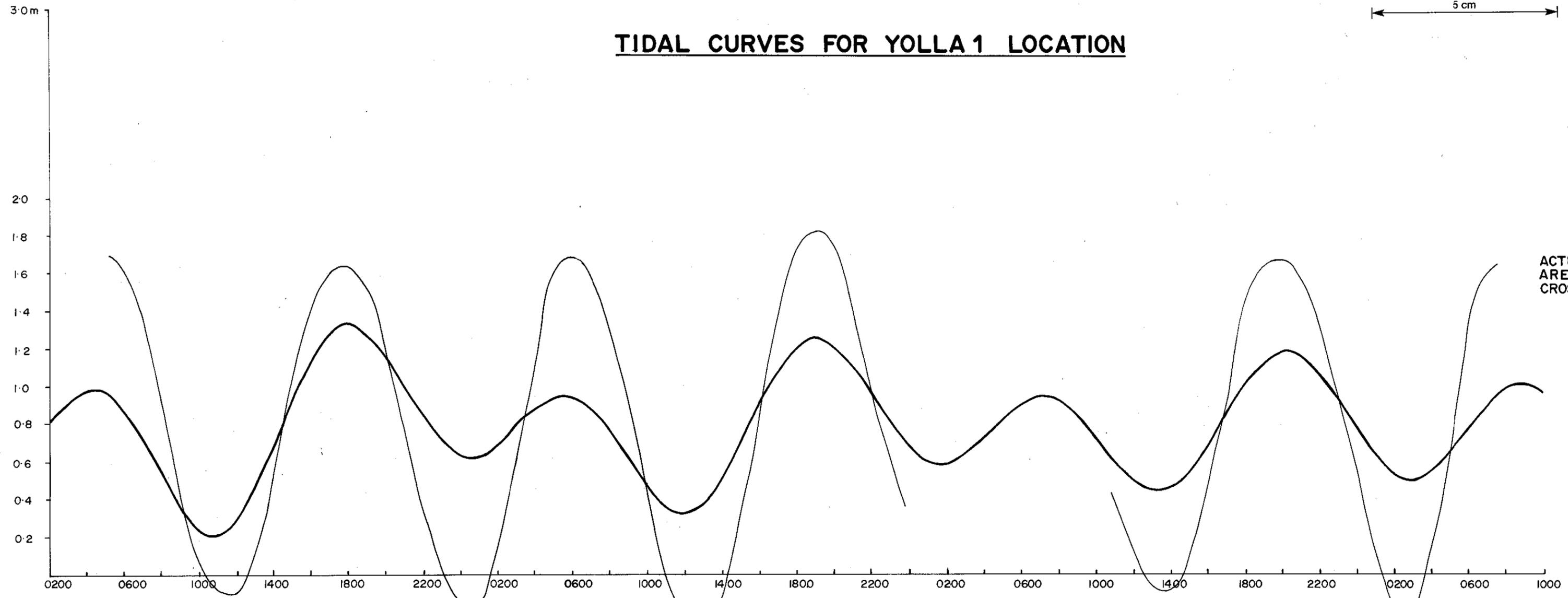
2/5/85

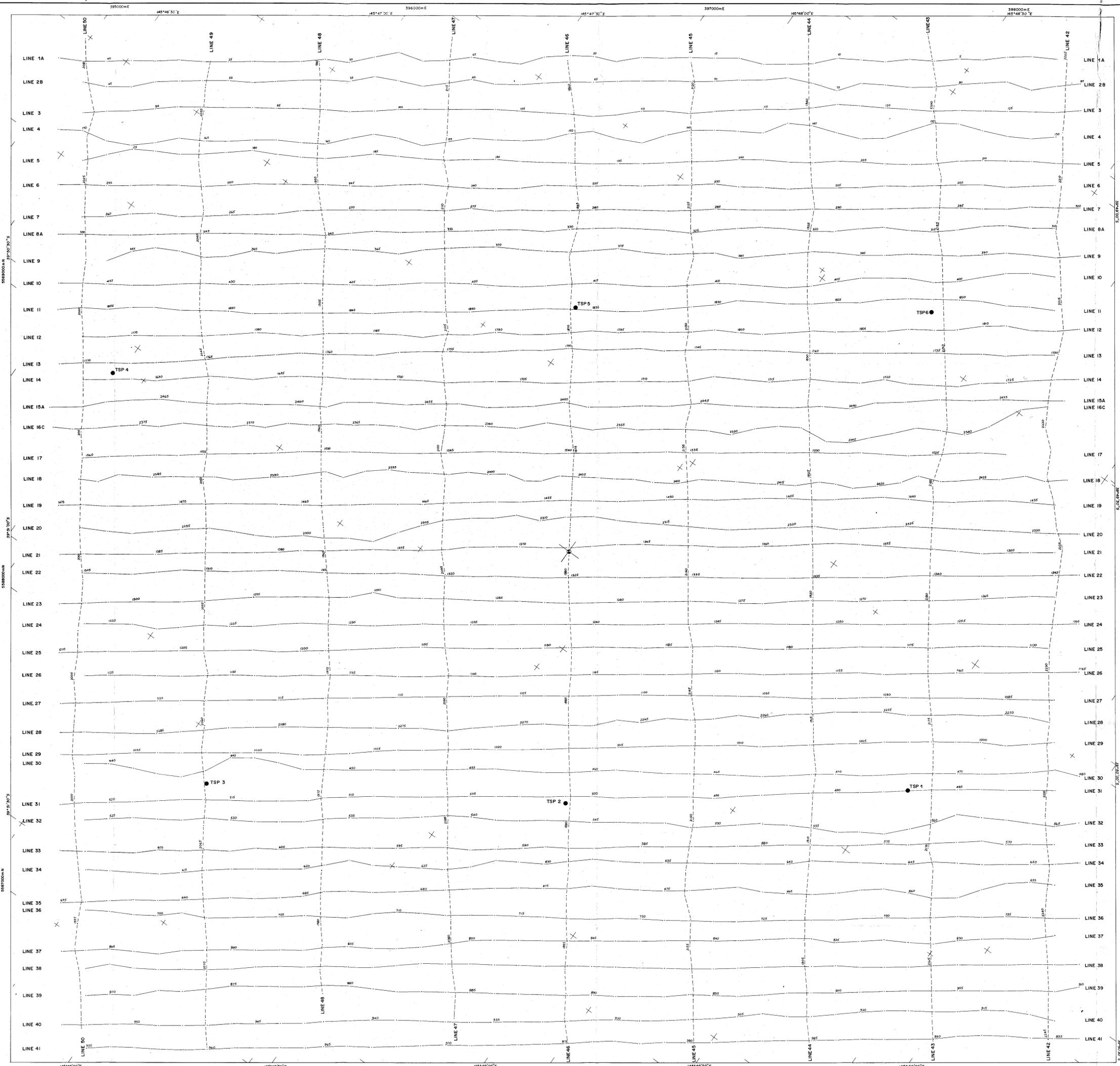
EASTERN AUSTRALIAN STANDARD TIME

ACTUAL TIDE IN SURVEY AREA, DERIVED BY CROSSINGS ANALYSIS.

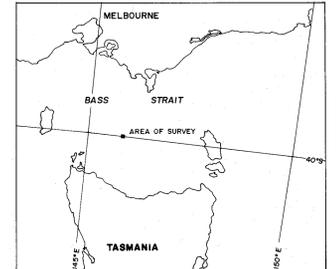
PREDICTED TIDE AT GRASSY, KING ISLAND.

OR-0309





LOCATION PLAN

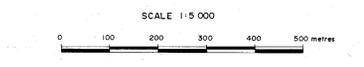


LEGEND

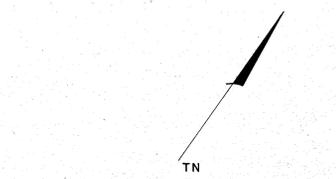
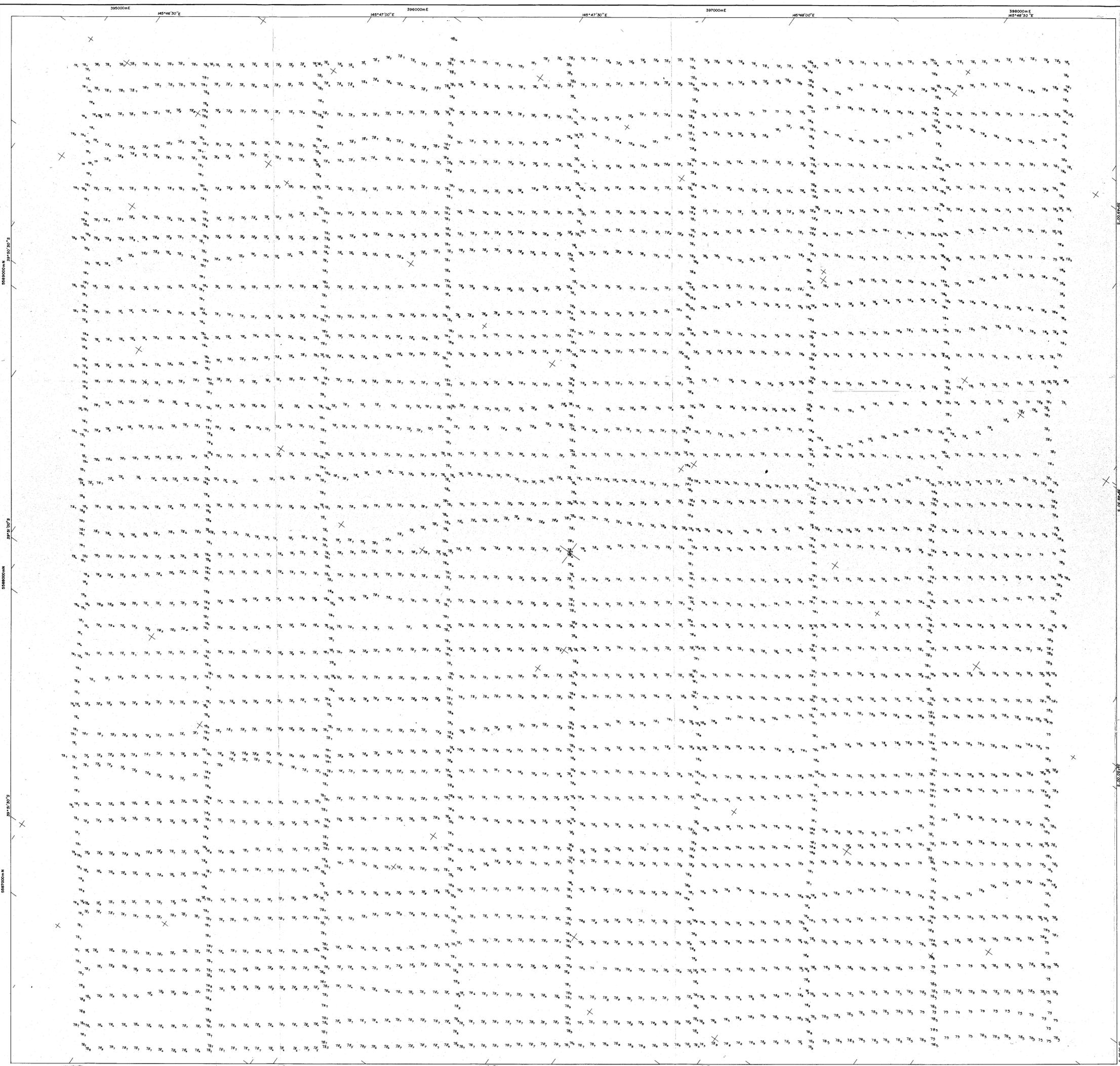
- PROJECT LOCATION
 39° 50' 00" S
 145° 48' 30" E
 5589016 444 m N
 400623 35 m E
- SEABED ACOUSTIC TRANSPONDERS.

SURVEY DATA

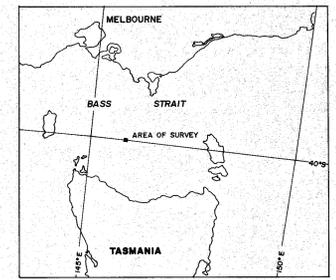
DATUM: AUSTRALIAN GEOIDETIC
 SPHEROID: AUSTRALIAN NATIONAL
 PROJECTION: UNIVERSAL TRANSVERSE MERCATOR
 CENTRAL MERIDIAN: 147° EAST
 FALSE NORTHING: 10 000 000 m AT EQUATOR
 FALSE EASTING: 500 000 m AT C.M.



302091
AMOCO AUSTRALIA PETROLEUM COMPANY
 SITE SURVEY ON
 LOCATION YOLLA 1
 POSITIONING OF MAXIRAN
 ANTENNA



LOCATION PLAN



LEGEND

- PROJECT LOCATION
 - GEOGRAPHICAL
 - UNIVERSAL TRANSVERSE MERCATOR
 - SOUNDINGS IN METRES REDUCED TO CHART DATUM AT GRASSY, KING ISLAND.
- (N.B. C.D. GRASSY IS 0.7M BELOW APPROXIMATE MEAN SEA LEVEL AT THE DRILLING LOCATION.)

SURVEY DATA

DATUM AUSTRALIAN GEODETIC
 SPHEROID AUSTRALIAN NATIONAL
 PROJECTION UNIVERSAL TRANSVERSE MERCATOR ZONE 55
 CENTRAL MERIDIAN 147° EAST
 FALSE NORTHINGS 10 000 000 m AT EQUATOR
 FALSE EASTINGS 500 000 m AT C.M.

SCALE 1:5 000

0 100 200 300 400 500 metres

302092

AMOCO AUSTRALIA PETROLEUM COMPANY

SITE SURVEY ON
 LOCATION YOLLA 1

BATHYMETRIC MAP

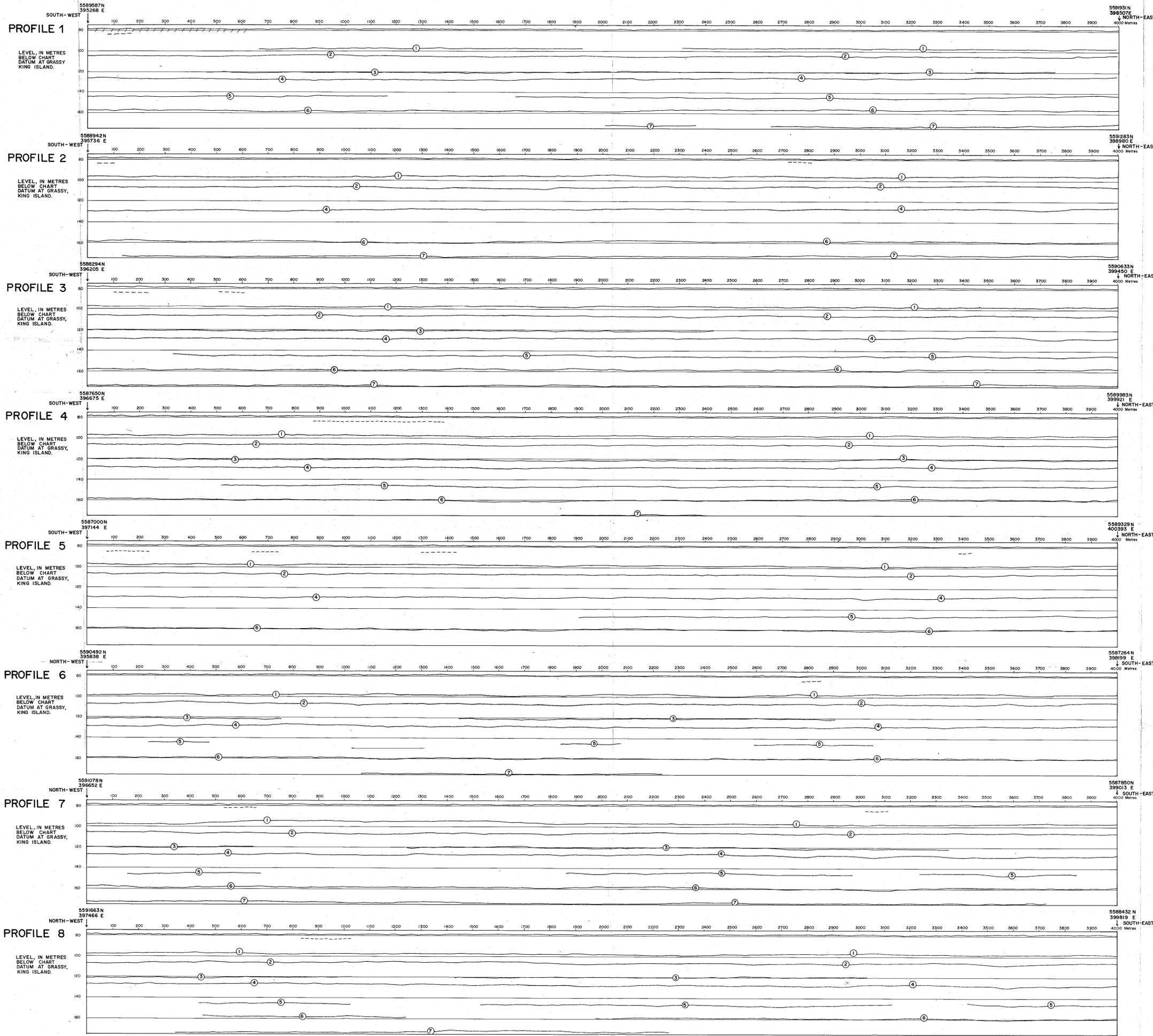
MAP No. 2

CR-0309

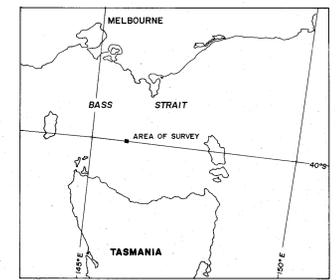


GEOMEX SURVEYS

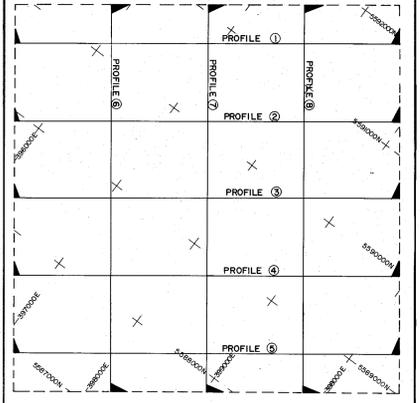
K071/85/AM



LOCATION PLAN



LOCATION OF PROFILES



LEGEND

- SEABED.
- ② MAJOR REFLECTING HORIZONS (AND IDENTIFYING NUMBER).
- - - MINOR REFLECTORS.

SURVEY DATA

DATUM AUSTRALIAN GEODETIC
 SPHEROID AUSTRALIAN NATIONAL
 PROJECTION UNIVERSAL TRANSVERSE MERCATOR ZONE 55
 CENTRAL MERIDIAN 147° EAST
 FALSE NORTHING 10 000 000 m AT EQUATOR
 FALSE EASTING 500 000 m AT C.M.

HORIZONTAL SCALE 1:5 000
 VERTICAL SCALE 1:1 250

302093

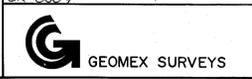
AMOCO AUSTRALIA PETROLEUM COMPANY

SITE SURVEY ON
 LOCATION - YOLLA 1

SEISMIC SECTIONS

DR. 0309

MAP N° 3.



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